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SECTION OF THE HISTORY OF MEDICINE.

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Section of the History of Medicine.

President—Dr. CHARLES SINGER.

Famine Dropsy and Pioneer Work in India.

By J. A. NIXON, C.M.G., M.D.

THE earliest reference to famine dropsy is probably that found in Hesiod [1], who in his "Work and Days" advises laying up good store against a bad winter "lest want overtake thee and thou press a swollen foot with wasted hand." Paley's comment is that the swollen foot is a symptom of famine, or rather of the weakness resulting from it, while the hand becomes emaciated.

In Hecker's "Epidemics" [2] the French army besieging Naples in 1528 is described as ravaged by pestilence and famine so that soldiers were seen with pallid visages, swelled legs, and bloated bellies, scarcely able to walk. Famine dropsy is said by Van der Mye [3] to have appeared during the siege of Breda in 1625. Sydenham [4] makes a passing allusion in his "Medical Observations" to the connexion between scurvy and dropsy, "ubi desinit scorbutus, ibi incipit hydrops," but does not explain how this came to be a popular saying. Lind gives an extract from a letter written by a Navy surgeon in 1762 which speaks of a novel form of scurvy in which dropsy was the outstanding symptom.

Koellreutter [5], a surgeon who served with the German troops in Napoleon's campaign of 1812, saw cases of dropsy from inanition during the disastrous retreat from Moscow.

The early years of the nineteenth century afforded only too many opportunities for observing the effects of famine even in times of peace. Holland [6] remarked upon œdema in the victims of the Irish famine of 1835.

At a discussion in 1847 at the Société de Médecine de Gand [7] the first clear and reliable account of famine dropsy and its post-mortem appearances was given by Lados and Mareska. The "Dictionnaire Encyclopédique des Sciences Médicales," 1878, contains complete accounts of the œdema which results from starvation. The condition was well known by this time in Europe, but the observations were superficial and unscientific.

Scientific work on this problem began in India. Dr. Cornish [8], who was sanitary officer of Madras during the Indian Famine of 1877, had for several years before the famine devoted much careful study to the problems of food-deficiency. He had recognized this form of dropsy under most diverse conditions, including troops on active service, and convicts in jail. He again drew attention to it amongst the famine-sufferers, and came thereby into conflict with the Special Famine Commissioner, Sir Richard Temple. Temple's contribution to famine relief was to advise the Government that the relief ration of grain might be somewhat reduced. Upon this reduced ration he reported that the famine victims grew fat. Cornish retorted with a minute to the Madras Government which is the "locus classicus" of famine dropsy

[1] At a meeting of the Section, held October 20, 1920.

literature. "Even in the weight test," he wrote, "some caution is necessary, for many of the people who come into the camps appear to be filling out and fattening when in reality they are getting dropsical and in a fair way to die." It may be mentioned in parenthesis that Temple received the K.C.I.E. in recognition of his famine services, and Cornish a greater tribute to his wisdom and persistency, namely, the distinction of having his name struck out by the Calcutta Government from the list of those recommended by the Madras Government for their work during the famine. Porter [9] was another officer of the Indian Medical Service who published accurate observations during this famine. He was the first to lay stress on the appearance which is now regarded as the crucial post-mortem sign of famine dropsy, the total absence of fat from its usual sites in the body and its replacement by œdema.

From this time onwards until the Great War no work seems to have been done on the subject except in India and the East.

While the memory of the famine of 1877 was fresh in the minds of medical officers in India a strange form of dropsy was seen among coolies imported from India to the sugar plantations of Mauritius [10.] Some writers have accepted the term "epidemic dropsy," which was applied to this outbreak, as synonymous with "famine dropsy." The description of the disease does not resemble famine dropsy, and there are reasons for believing that it was ankylostomiasis.

Just before the war Greig [11] and his fellow workers in India were seeking for a deficiency factor to explain a dropsy which was neither beri-beri, scurvy, nor ankylostomiasis. It must not be forgotten that Cornish had obstinately maintained in 1877 that the principal factor in the production of this form of dropsy was deficiency of nitrogenous food.

With the Great War famine dropsy came back to Western Europe. It made its first appearance in October, 1914, at Lille [12.] The Germans had occupied the town in August, and its large industrial population was suddenly stripped of everything, so that many of the inhabitants had nothing to eat except potatoes. This dietary produced many cases of anasarca without albuminuria. In 1915 the disease appeared in German prisoner-of-war camps, also among the civil population in famine-stricken Galicia and Poland. Some time elapsed before it was realized that this œdema was no new disease, but had accompanied many former wars, sieges and famines. It is not my intention to bring my story into the period of the war itself. The previous history is interesting enough, and my principal object was to remind this Section of the pioneer work of the I.M.S., which has been so brilliantly continued by McCarrison, Greig and other officers of that service.

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Section of the History of Medicine.

President—Dr. CHARLES SINGER.

Galen as an Epidemiologist.[1]

By M. GREENWOOD.

THE CONCEPT OF EPIDEMIOLOGY.

GALEN defined epidemiology[2] very much as do our modern text-books, contrasting diseases affecting larger or smaller numbers within narrow limits of time with endemics or sporadics which do not conform to the same chronological rule.

Dr. Crookshank has pointed out that this definition is too narrow. In the passage which contains the usual definition, Galen also remarks that "there are three causes of disease: the first resides in that which enters the body, the second in that which happens within it, the third in what outwardly affects it."

Expanding this idea, we may say that the manifestation of disease involves three factors, an external exciting cause, an external predisposing cause, an intrinsic cause. The business of the epidemiologist is to seek a general knowledge of what falls under each of these three categories and of their inter-relations; he is concerned with disease, however, as a mass phenomenon, not with individuals but with aggregates.

The obvious criticism of this enlarged definition is that it confuses epidemiology with ætiology; it does so because there is no qualitative but only a quantitative distinction.

The case is similar to that of the so-called "laws of chance." Clerk Maxwell's "demon" would have had no use for Bernoulli's theorem; perceiving every tiniest motion in the tossing of a penny, accurately gauging the resistance of the air, the impetus of the spin and the impact, he would *know* at each several trial whether the coin would fall head or tail. In his world, Professor Karl Pearson's occupation would be gone and the business of life insurance a memory. But in our world it is useful to have a system which predicts not what *must* but what *may* happen, which estimates the likelihood that what may be will be. When, in our art, knowledge of individual ætiology is complete, the ætiology of averages, which is epidemiology, will be superseded. Notwithstanding the intensive graduate training which so many thousands of our American colleagues embrace, some few years may elapse before the millennium; until then, a rough ætiology of aggregates which is epidemiology, in the sense of the present paper, has its value.

[1] At a meeting of the Section, held November 17, 1920.

[2] Kuehn XVII (*a*), p. 1.

Hippocratic Epidemiology.

According to Galen, an epidemiologist should first master *De Natura Hominis*, *De Aere, Locis et Aquis*, such of the aphorisms as treat of weather and temperaments and lastly the Prognostics. To these I should be disposed to add *De Prisca Medicina* and *De Ventis* (held by Littré to be of the Coan school). Thus fortified, the student can examine the "genuine" epidemics themselves.

I have not to swell out this paper with a description of what these accessible classics and the splendid commentary of Littré have made familiar. It is needless to do more than mention the fact that hardly any theoretical doctrine of epidemiology to be found in Galen is not present at least in embryo in the Hippocratic corpus. For instance, the passage in *De Febrium Differentiis* which I shall shortly quote, is based on a chapter of *De Ventis*.

Two points must, however, be made. The first is that the humoral and miasmatic doctrines of the Hippocratic corpus are vague and sometimes conflicting; it would have been easy for a Socrates to reduce them to absurdity and with no more knowledge of objective medicine than the Hippocratic books themselves afford.

The second point is that the author of the "genuine" works attached less importance to these ætiological speculations than did either his philosophical contemporaries or his medical (dogmatic) successors. The impression one derives from *De Aere, Locis et Aquis* and from the first and third *Epidemics* is that the author is submitting to the scientific public examples of a method of research by the prosecution of which materials for constructing a science of general ætiology might ultimately be garnered, not that he supposes the task to have been completed. There is in fact, a modesty, a sense of the unknown, of the greatness of the task and imperfection of the results which we hardly find elsewhere. Sydenham fully recognized the intellectual qualities which I am attempting to express; his recognition of them, more than any positive contribution of that great physician to our knowledge, justifies the rank he has been accorded in the history of epidemiology.

Epidemiology between Hippocrates and Galen.

To form a judgment of the trend of epidemiological history from the time of Hippocrates to the second century of our era is not a much more promising task than the proverbial search for the black cat in the dark room. Galen indeed often quotes his predecessors and has left a series of semi-historical treatises. Galen, too, was not a petty-minded man and, perhaps, as candid as it is given to a keen controversialist to be. But so was Bishop Berkeley: yet we should not form a very accurate conception of early eighteenth century rationalism from *Alciphron* or of the Cambridge analysts from a "Discourse addressed to an Infidel Mathematician." Celsus, almost our only independent witness, was perhaps not a practitioner and certainly not writing for a professional public. His limitations and his merits have often been pointed out, but I have not seen any comment upon the parallelism of Celsus' introductory sketch and Galen *De Sectis ad eos qui introducuntur*. Both writers are contrasting the three sects, Empirics, Dogmatists, Methodists; both are writing for those with little technical knowledge; both reach similar conclusions. From the artistic side, the Roman deserves the preference. Galen proclaims the superiority of the rationalists but it was Celsus who said "multa sunt ad ipsas artes proprie non pertinentia, tamen eas adjuvant,

excitando artificis ingenium," and Celsus who said that Hippocrates and Erasistratus did not become physicians because they transcended the limits of their technic, but they did thus become greater physicians. Galen pours scorn upon the methodists but his sarcasm is journalese in comparison with the pithy phrase of Celsus, "Neque adjectum quidquam empiricorum professioni, sed demtum est; quoniam illi multa circumspiciunt, hi tantum facillima, et non plus, quam vulgaria."

Both testimonies agree in assigning to the empirics a principle of *investigation* which, as I think, was the motive of both *De Aere* and the genuine Epidemics, inspired Sydenham and was utilized in clinical research in the nineteenth century by Louis. Was this ever more than a pious opinion? Did any of the empirics leave epidemiological records at all on the lines of the constitutions of Thasos? Celsus does not tell us nor does Galen. Whether because there *was* nothing to tell or because he did not think it worth the telling cannot be known.

The General Epidemiological Doctrine of Galen.

The position then at the time Galen wrote was that he had before him the Hippocratic writings which illustrate how epidemiological data may be collected and *possibly* had later examples of the application of the method. He also had the theoretical interpretations of the facts provisionally adopted by the Hippocratic writers and—this, of course, not possibly but certainly—many other theoretical schemata. The epidemiological observations were incomplete and the theories inadequate to describe even such observations as had been collected. There were two tasks to perform; to extend the observations and to amend the theories. Galen deliberately confined himself to the second task.

He alludes more than once to Thucydides' account of the Athenian plague and in one place (*De Diff. Resp.*, II, 7) with the sneer that Hippocrates did not describe the obvious, but Thucydides was a layman writing for laymen, Hippocrates an expert writing for experts. "No man," said Bentley, "was ever written down except by himself," and nothing in the voluminous writings of Galen is a better excuse for Sydenham's contempt of Galenism than that gibe.

Not one of the many references to pestilence indexed by Brassavola,[1] brings to light a single *epidemiological* observation. Passages in the Hippocratic epidemics which Galen has annotated and which do indeed cry aloud for illustrative examples, fail to call forth a single illustrative example from the memory of one who had lived through the Antonine plague.[2] As Littré said: "excepté quelques mots épars dans ses volumineux ouvrages, excepté quelques indications fugitives, il ne nous a rien transmis sur un évènement médical aussi important."[3] Nothing can do more than mitigate the censure which this failure to emulate his master deserves; how far Galen's execution of the second part of his duty should mitigate the censure we have now to inquire.

The epidemiological position of the Hippocratics was roughly this. They attributed to a discord of the elementary qualities the innate factor of disease,

[1] The index of Antonio Musa Brassavola appeared first in the great second Juntine edition of the works of Galen, Venice, 1550, and in many subsequent editions.

[2] See *Method. Med.*, X, 11.

[3] "Œuvres d'Hippocrate," I, 355.

but were vague and inconsistent in their classification of discords; acquired external causes were habits of life, exciting causes when distinct from other extrinsic factors were to be found in the pneuma. To understand the Galenical recension of this doctrine, it is well to begin with *De Febrium Differentiis*, composed in or about 180 A.D., when Galen was at the zenith of his powers. I will partly paraphrase and partly translate the early chapters of this work.[1]

"The differentiae of fevers are fundamental and accidental and the accidental differentiae are very numerous; in enumerating them we are never to lose sight of the fundamental differentiae. The primary differentia is of course unnatural heat, this is at the back of everything, but we are to take pains not to confuse excess of quantity, nature of matter heated and manner of motion; to pour boiling water into a cold kettle is not the same thing as to pour cold water into a hot kettle. Everybody knows that fatigue, anger, sorrow, a chill and many other things will start a fever. Again, persons not entirely bereft of their wits are aware that a pestilential state of the atmosphere will give rise to a fever, and they also know that it is risky to come into contact with the plague-stricken for there is a danger of contagion, just as there is from scabies or ophthalmia or indeed from phthisics or any who expire bad air so that their living places reek. Those who do not take proper exercise or who eat bad food or expose themselves to heat stroke are particularly liable to suffer."

"These obvious facts are known to everyone, but the reasons for them are not equally well-known. There are two types of fool: there is the fool who depends on experience alone as if rational inquiry were useless in the research of natural phenomena; then there is the fool who thinks he is wise, and has the reputation of wisdom, but is really quite as much of a fool as his fellow because, never having acquired any skill in logical methods, he is always discovering mares' nests. When self-assurance is added to folly, some reach such a pitch of impudence that they will deny validity to causes which even the ignorant empirics have recognized. However, it is not worth while to argue with these persons, the more so as it has been done elsewhere. What we have to take firm hold of is that a disease is the result of a discord between the elements, and a fever comes about when unnatural heat is generated in the heart. The differentia of the heat depends upon the differentia of the matter heated and this matter is again triplex; the fever may begin in the heart or in the humours or in the spirits; before all this, however, come the manifest causes which even an empiric finds instructive while of course a rationalist draws still more advantage from them."

We now come to the sixth chapter,[2] and I pass from paraphrase to free translation.

"For the rest, the warmer katastases of the atmosphere around us, such as are most likely to occur about the rising of Sirius, when inspired evidently inflame the heart; impinging upon the body from without they warm it as a whole, in particular the arteries which absorb not a little of the aerial substance; from all of which the heart must be at once affected and be immoderately heated, acquiring a maximal degree of febrile affection, and impregnate therewith the whole body. Indeed, given a pestilential katastasis, inspiration is the principal factor. For sometimes the fever is generated through the humours which are ripe for putrefaction when the animal has experienced the exciting cause from the atmosphere, but mostly the origin is inspiration of air infected with a putrid exhalation.

"The beginning of the putrescence may be a multitude of unburned corpses, as may happen in war; or the exhalations of marshes or ponds in the summer; sometimes it is the immoderate heat of the air itself as in that pestilence of which Thucydides writes: 'a corruption seized the bodies of men in their close and ill-ventilated hovels. The

[1] Kuehn VII, pp. 273 *et seq.*

[2] Kuehn; cap. 4, *ap. Juntas.*

starting point of the pestilence was the preparation for putrefaction of the humours of the body due to bad food. It may be, too, that atmospheric continuity was a factor, that products of putrefaction came from Aethiopia which were destined to be a cause of fever in the persons whose bodies were prepared to sustain this injury.' Always this is to be remembered, that no cause can be efficient without an aptitude of the body; otherwise all who are exposed to the summer sun, move about more than they should, drink wine, get angry, grieve, would fall into a fever. Or, again, all would fall sick at the rising of the dog star and in a pestilence all would die. But, as I have said, the chief factor in the production of disease is the preparation of the body which will suffer it. Let us imagine, for instance, that the atmosphere is carrying divers seeds of pestilence and that, of the bodies exposed to it, some are choked with excrementous matters apt in themselves to putrify, that others are void of excrement and pure. Let us further suppose an obstruction of orifices and resultant plethora in the former, likewise a life of luxury, much junketting, drinking, sexual excess and the crudities which must attend on such habits; in the latter let us suppose cleanliness, freedom from excrementous matters, orifices unobstructed and uncompressed, desirable conditions, as we may say, free transpiration, moderate exercise, temperance in diet. All this being supposed, judge thou, which class of body is the likelier to be injured by the inspiration of putrid air. Is it not plain that the former class from the first inspiration will receive a beginning of putrefaction and that bad will go to worse, while those which are pure and void of excrement will either escape altogether or suffer so little damage as easily to return into the way of nature? Hence then, although, so often as the katastasis of the atmosphere departs from its proper nature into the hot and humid, pestilential diseases must needs arise, yet will those chiefly be affected who were beforehand saturated with excrementous moisture while those who labour moderately and are temperate in diet remain refractory to such diseases. This has been said of one example but it is an universal truth."

These passages do not, I think, unfairly portray Galen's intellectual weakness and strength. In the former, with its sharp *ad captandum* way of making points and cheap epigrams, we have the model of the *Graeculus esuriens*, the degenerate issue of the glorious academy; in the latter breathes a spirit not unworthy of the ancient great.

Let us now consider the implications of Galen's doctrine. There are involved three factors, two are innate, or acquired, habits or functions of the the body, the temperamental and the procatarctic factor; one is wholly external. Galen distinguishes between an original disposition of the body, the innate factor, together with changes imposed upon it by growth and habits of life on the one hand and general external (procatarctic) causes on the other. To these two groups of factors he attaches more ætiological importance than to the third, wholly external and, as we should say, specific cause.

The first of these groups is the subject of the *De Temperamentis*, next to *Ars parva* the most famous of Galen's purely medical works. The philosophy of the four elementary qualities has often been discussed, here I am only concerned with the use to which Galen put the symbols. His hypothesis and its difference from that current before his time may be most intelligibly expressed in geometrical language.

Let us take rectangular coördinates in a plane and measure along the abscissa one pair of opposites, say the moist and the dry; along the ordinate let us measure the other pair, the hot and the cold. Then the point (0, 0), the origin, represents the eucrasis, or perfect harmony and points situated on either axis represent simple excesses, simple dyscrases. Most (not all) earlier writers were preoccupied with these simple excesses, but Galen embraced in his scheme all points of the plane. Thus we reach his

conception of nine temperaments. The first, perfect eucrasis, is (0, 0), then there are four simple dyscrases—viz., y positive or negative with $x = 0$, and x positive or negative with $y = 0$; finally there are four linked or compound dyscrases represented by x and y both positive, both negative or of unlike sign. Galen then introduces a third dimension. If we suppose that the frequencies of occurrence of each combination of x and y are represented by a line of appropriate length at right angles to the plane of (x, y), we reach the now familiar concept of a frequency surface, $z = f(x, y)$, and the whole distribution of what we should now call resistance to disease is theoretically assigned.

Galen of course does not use this notation, since he lived 1,500 years before it was invented, but it will, I think, be found that what I have written is a faithful account of his doctrine of temperaments.[1] Further, he is careful to observe the principle of continuity. He specifically and at considerable length (*see* especially *De Sanitate tuenda*, bk. I, cap. 5) declines to limit the notion of "health" to a single point (0, 0), or in the present generalization to a single ordinate $z = f$ (0, 0), but recognizes that departures from the origin within certain limits are compatible with health. In geometrical language, healthy temperaments are represented by that portion of the frequency surface bounded by two pairs of planes intersecting it.

The Galenical concept is of value; it is the earliest rationalization of the principle that in an aggregate, such as a human population, we should expect to find a continuous gradation of the qualities apt to favour the evolution of morbid processes. Those who in our own times, from Quetelet to Galton, Karl Pearson and his pupils, have handled the problem statistically have striven to express Galen's idea, to determine *what* function of x and y z really is. Notice that by entertaining this idea of nine temperaments, Galen, albeit unconsciously, frees himself from the naïve implications of the qualities themselves, *they* become mere specifications of direction, symbols.

I do not of course suggest that the modern investigators I have named were directly influenced by Galen or that his generalization did in fact lead to any epidemiological results of value. But there is irony in the thought that the physician to whom we owe this scientific nominalism, this germ of a notation which might have been developed to the advantage of epidemiology long ago, has, and perhaps deserves, the reputation of being an arch-realist, the exponent of that realism which Dr. Crookshank justly rebuked last year. A great deal of *De Temperamentis* and even more of *De Febrium Differentiis*, to go no further, is as ingenious and as trivial or, if that be too harsh a word, as remote from life as the subtilties of the chess problem are from the practice of that game. The doctrine then of the continuous distribution of temperaments deserves respect; actually it was sterile but it is potentially fruitful and there is still much to be done on the lines of Galen's adventure.

Of the rôles of heredity and environment in the genesis of temperament there is perhaps little to be learned from Galen. It would be possible to quote detached sentences which are worthy of attention, but hardly to deduce a connected system.

The second group, that of non-specific external factors, the procatarctic causes, need not detain us long. Not because Galen slighted them, but because he has not developed any systematic theory comparable to that of

[1] Allowing for the difference of point of view, Hecker's account of the matter (*Geschichte der Heilkunde*, Berl., 1822, Bd. i, p. 498) is very much the same as mine. Hecker's account of Galenical and pre-Galenical medicine is, I think, more valuable than his better-known epidemiological works, notwithstanding his tendency *chercher raison où il n'y en a pas*.

the temperaments. The special treatise *De Causis procatarcticis* (which only survives in a Latin translation) is an angry polemic and not a happy example of Galen's style. He accuses his opponents of verbalism—most controversialists do—but is himself making them offenders for a word. His dispute with Erasistratus turns upon a matter of definition. Erasistratus apparently held that because, for instance, all exposed to excessive heat did not fall sick and because the degree of illness did not vary directly as the severity of exposure, therefore the *word* cause should not be used when speaking of exposure to heat in connexion with sickness. Nothing quoted by Galen suggests that Erasistratus, or anyone else, believed that the exposure was unimportant and not contributory to the result. There are, however, two points in the essay worth noting. The first is this sentence—"Immo faciles reperias aliquos qui ne semina quidem febris concipiant. Quae vero sint febris semina, non spectat ad nostrum in praesenti institutum." This raises a question to which I shall shortly return. The other is that, even in a treatise devoted to the championing of procatarctic causes, Galen returns to the importance of disposition or predisposition. In the *ad captandum* method, usual in his polemics, he remarks that if an athlete struck an old woman with his fist and she died, it would be absurd to say that the blow was not the cause of her death merely because the athlete had before given and received many equally severe blows without evil consequences. But he adds, that if another Erasistratan were to plead that the "cause" was the weakness of the old woman, *that* argument would be worthy of more attention.

Contagion.

We have seen that Galen attributed mainly to differences of temperament and habits of life the fact that in a pestilence some are taken and others spared, but he naturally recognized that pestilences were not always raging and, like the rest of us, wished to explain why they occurred when they did occur; to this end, he postulated an external specific factor, or factors, the nature of which we have now to discuss.

Popular medical history is neocentric; it catches at words or phrases in ancient literature which seem to suggest that the author had an inkling of what we now suppose to be the truth. Some of the expressions quoted in this paper might suggest that the doctrine of *contagium vivum* was present in the mind of Galen. He speaks of air-borne "seeds of pestilence," he remarks that the danger of contact with the plague-stricken is notorious and actually cites in the connexion, scabies, ophthalmia and phthisis. Spiritual paternity has been assigned on slighter evidence than this; did not Hecker attribute to Galen the discovery of the circulation?[1]

Ages ago a concept of solidarity between all living things found its expression in the lore of sympathetic magic. Its two forms, homœopathic and contagious magic *may* be, as Mr. Hirn suggested,[2] essentially identical, homœopathic magic derived from contact magic through some hypothesis of emanations. However this may be, it is certain that a fear of contagion in *all* forms of evil is immensely old and that the contagion of physical disease is not the starting point of this belief afforded by observation of epidemiological facts, but a particular case subsumed under a general law.

[1] *Geschichte d. Heilkunde*, 1, 489. Haeser's comment (Haeser, *op. cit.*, p. 363) that the opinion is "durch Nichts zu begründen" is perhaps too harsh. Galen's claim is ill-founded, but not worse founded than that of some other candidates for the honour which belongs to Harvey.

[2] *See* Frazer, "The Magic Art" ("Golden Bough," i, p. 54).

Then we have a second intellectual element, a thing of yesterday compared with sympathetic magic, but absolutely ancient: the doctrine of miasma. Its most familiar literary expression leads up to the tremendous lines in which Lucretius rendered to the Roman public Thucydides' story of the Athenian plague.[1] Here disease is interpreted in terms of vibrations. A motion of particular wave form having been imparted to the atmosphere by the fortuitously arising impacts of the atoms, that wave impinging upon man's body sets it, or parts of it, into sympathetic resonance. If the body is attuned to the atmospheric note, disease results; in time of pestilence the atmospheric wave form is congruent with a large number of the human resonators and so many are stricken.

The analogy I have just used will serve to explain how this apparently quite distinct concept may be related to that of contagion. Let us arrange a large number of tuning forks on resonance boxes and place at a distance a source of sound generating a mixture of the fundamentals of the forks; some will be set into sympathetic vibration. Suppose them arranged in file and the source at one end, let them all have the same fundamental and one after the other will pick up the note. Conceive our powers of appreciating time intervals immensely magnified, or the velocity of sound waves much reduced, and we shall perceive an orderly progress of vibration from one end of the file to the other. To the observer it will seem more dangerous to be at one end than the other and that each successive fork derives its vibrations from the neighbour. If one were allowed to repeat the experiment using first one and then several forks, it would be plain that the number of the forks did not matter; but when we *always* use a number of forks, this will not be obvious since if, so soon as the first fork has started to vibrate, we remove its next door neighbour and put the latter at the end of the row, *it* will begin to vibrate after a longer interval than the next but one in original order, while if, in the meantime, the external source of sound has been taken away, it may never vibrate at all. Under *these* conditions we *can* save the fork from the plague of sympathetic resonance.

Hence, on a vibratory or miasmatic hypothesis, contagion may be an ostensibly important factor. How does this concept differ from the *contagium vivum* of Fracastorius and of our own time? In this, that the modern doctrine assigns an *active* rôle to the successive recipients, there is a fresh liberation of energy in each item of the series; as each fork picks up the note some machinery attached to its resonance box is set into action so that it will continue to vibrate, and to pass on its vibrations, without needing any further supply of energy from the external source of sound. To change the metaphor; there is a vast difference between a fire running through a street of wooden houses and a fire in the same street when each house has a domestic powder magazine.

A criterion of any doctrine of contagium is whether it passes this test; is it something *more* than conduction? If it is not, there is only a verbal identity with post-Fracastorian teaching and a fundamental difference of mechanism.

Nearly 100 years ago, Dr. C. F. H. Marx published at Carlsruhe an interesting little book entitled "Origines Contagii."[2] He stated in his preface that, in view of repeated statements of modern writers, he had not expected to find any clear indications in the works of classical antiquity that the

[1] *De Rerum Nat.*, vi, 1088.

[2] Carlsruhe, 1824. *Additamenta*, containing corrections and additions, were published in 1826.

contagious principle of various diseases was understood. To his surprise, he found that the doctrine, far from being unregarded, was almost a commonplace ; he condemns the opinion that Fracastorius should be credited with the first promulgation of a correct theory and cites in support of his belief our countryman Russell who published a treatise on the plague in 1791. Marx did not find in Galen any passages of importance which I have not already quoted, but he cites many other writers. I will briefly review his Latin authorities (adding one or two references he does not give) ; they are a fair sample.

Contagion is mentioned at least five times by Livy. In the sixth chapter of Book III, we read that in the consulate of L. Aebutius and P. Servilius there was a great pestilence among men and beasts, that " ea colluvio mixtorum omnis generis animantium et odore insolito urbanos et agrestem confertum in arcta tecta aestu ac vigiliis angebat, ministeriaque invicem ac contagia ipsa vulgabant morbos." In Book IV, cap. 30, we read that in the consulate of A. Cornelius Cossus and T. Quinctius Pennus, there was a great drought and cattle murrain that " vulgatique contactu in homines morbi : et primo in agrestes ingruerant servitiaque, urbs deinde impletur. Nec corpora modo adfecta tabo sed animos quoque multiplex religio et pleraque externa invasit." In Book V, the word *contagio* is twice used figuratively. Thus (cap. 6) : " quam ut seditionibus primum urbs Romana, deinde velut ex contagione castra impleantur ? " and (cap. 12), " haud procul erat quin castra quoque urbanae seditionis contagione turbarentur." Lastly in Book XXV (cap. 26) there is an account of the Syracusan epidemic. This began in a hot autumn and at first men fell sick from the unhealthiness of the season and the place but, in time, " curatio ipsa et contactus aegrorum vulgabat morbos," and finally we have the picture so often painted : " what with terror, and, above all the foul presence and fatal smell of the corpses, the dead were the destruction of the diseased and the diseased of the sound and healthy."

Vergil provides us with two references. The first is a single line in the first Eclogue :—

" Nec mala vicini pecoris contagia laedent."

The other is a passage at the end of the third Georgic which owes much both to Thucydides and to Lucretius :—

" Ne tondere quidem morbo inluvieque peresa
Vellera nec telas possunt attingere putris ;
Verum etiam, invisos si quis temptaret amictus,
Ardentes papulae atque immundus olentia sudor
Membra sequebatur, nec longo deinde moranti
Tempore contactos artus sacer ignis edebat."

It is hardly worth while to go on with the list. Most remember Juvenal (II, 78), some, Seneca (*Epist.* 59, 9), possibly a few, Isidore's definition, " Pestilentia est contagium quod, dum unum apprehenderit, celeriter ad plures transit " (cited from Marx, *op. cit.*, p. 111). Does one of the statements contain anything incompatible with what I may call the *conductive* form of contagion, which is deducible from the miasmatic theory, and involving a *contagium vivum* in the sense of Fracastorius ? I think not ; one might suggest that the references in the early decades of Livy, i.e., when he is dealing with remote events, rather smack of the primordial belief, the magical contagion, while when he writes of pestilence observed by educated men, he adopts the idea of contagion which depends upon the miasma.

But these are all extracts from the writings of laymen. The remarks of physicians were, however, similar. Hardly anything in the Hippocratic corpus can be pressed into service. Marx indeed suggested, following Diemerbroeck, that Hippocrates' *τὸ θεῖον* was contagion. *Credat judaeus.*

Galen I have already quoted. Neither in his works nor in the passage of Caelius Aurelianus[1] who tells of a seamstress who developed hydrophobia on the third day after repairing clothes bitten through by a mad dog, having moistened the cloth in her mouth, is there anything incompatible with conduction.

Marx was surprised that he found less in the technical than in the non-professional writings and attempts to explain the fact on theoretical grounds. A simpler explanation than his is that we are all a little scornful of the amateur; that the educated man usually despises folk beliefs. The Greek physicians would be contemptuous of popular contagious magic, while the part of contagion, as above defined, in the scientific theory of miasma, although, I think, definite is plainly subordinate to that of the primary external cause which is projected into the atmosphere.

For these reasons, I suggest that Marx was deceived by a verbal similarity, that his inference was false and that to the theory of *contagium vivum* Galen contributed nothing.

The Weather and Disease.

The really important Galenical doctrine of external causes is therefore almost wholly concerned with states or katastases of the atmosphere, and he is here discussing a matter of great interest. It is not so easy to summarize his view of this branch of epidemiology as the doctrine of temperaments, because his chief writings on the subject are embodied in the commentaries upon Hippocrates' epidemics. I will attempt to summarize the relevant comments. In the following paragraphs the figures in brackets refer to the pages of Kuehn XVII (*a*).

General (epidemic) diseases nearly always arise from the interplay of the universal external medium, the air, and the bodily temperaments. No other cause is universal and perennial and the temperaments must therefore react to changes in the atmosphere. Blood is the dominant humour in the spring, yellow bile in the summer, black bile in the autumn, phlegm in the winter and diseases derive their clinical type from the dominant humours. It is not the name of the season that matters but its quality; in any season heat followed by cold leads to disease of autumnal type. The reason for reducing the atmospheric katastases to four is a need of simplicity and because these are typical (27). To attempt a complete empirical specification of all types is hopeless, the particulars are too numerous; we must, as in the study of languages, begin with the essential elements. In general, winter is excessive with respect to cold and moisture, summer in regard to warmth and dryness, spring in neither; spring is without the contrasts and oppositions of autumn. Normally the seasonal change is a continuous process, then, as both reason and experience teach, we have no pestilence or epidemic diseases but only sporadics. The atmospheric katastasis directly generates its congruent humour, so that, for instance, when the winter is true to type phlegm will be produced (43). Evaporation is important (44). It is necessary to consider the natural temperament of the individual in foretelling the effect to be produced on him

[1] *Morb. acut.*, III, 9.

by the katastasis, thus a moist katastasis is bad for a naturally humid temperament (96·7). It is admitted that fevers may arise not generated by the katastasis but *per accidens;* these, however, are seldom dangerous. The pestilential katastasis is not to be regarded as the cause of one specific disease, any prevalent fatal disease is a pestilence. The necessary katastasis is warm and humid, and probably this humidity is the cause of putrefaction of the humours (646 *et seq.* 667).

These few notes contain, I think, the essence of Galen's teaching. In the original, endless repetitions, trivial polemics and paraphrases of Hippocrates swell out the commentaries to a bulk which will try the hardiest literary digestion.

The prime external factor of epidemic disease is, then, the atmosphere. To the smooth periodic change of the seasons, normal man is perfectly adapted, such sickness as he experiences is *per accidens.* But if there be seasonal discontinuity, disease will be generated. If we make the differentiæ of atmospheric conditions, of katastases, continuous and recall that the same is true of resisting power, temperaments, a complete symbolical representation of all epidemiological possibilities is reached. This is the full Galenical recension of the Hippocratic theory.

I shall have something to say of the consequences, but, before saying it, would note that among the reasons for the complete sterility of Galen's epidemiological system is the intercalation of an actually observed fact into an ideal scheme—not a common occurrence in his writing.

This is the exceptional position assigned to the warm and moist katastasis. The doctrine of temperaments was symmetrical; why should not that of katastases be so too, since it is but a projection of the temperamental system? The answer is that in Southern and South-Eastern Europe, the warm and humid katastasis *was* pestilential.

Littré pointed out that the clinical records contained in the Hippocratic books of epidemics corresponded ill to anything seen in Paris but well to the accounts of physicians who had practised in subtropical or tropical countries. It is not unduly straining the evidence to infer that much of the epidemic disease both of the Coan physicians and of Galen was malaria; so we can easily understand why warm and humid katastases should be especially deadly.

But, to an observer stationed further west, in a time when "pestilences" were not malarious, the special local conditions of Greece and Italy would be unknown. Yet, as what Galen wrote *must* be true, and as this did not *seem* to be true, the words must conceal a deeper meaning to be discovered by dialectic. To this we owe much mystification. The suggestion is not, I think, too insulting to the intelligence of our mediæval colleagues, for Sydenham has been accused, not without justice, of seeking to find the constitutions of Thasos reproduced in London of the seventeenth century.

I have now described Galen's epidemiological position, so far as I understand it, and purpose to inquire whether this system is only of interest in so far as the content of a doctrine professed by many generations of physicians must always be interesting, or whether it embodies ideas which are still capable of scientific development. In effect Galenical epidemiology is a systematization of two principles. The one, that of temperaments, proclaims that the resisting power of the human body to the extrinsic causes of disease is naturally varied owing to inborn diversities of function or structure, and can be altered by the operation of acquired habits or environmental conditions while an attempt is

made to furnish objective criteria of these diversities. The other principle, that of atmospheric katastases, assigns to similarly varied conditions of the "atmosphere" a principal role in the genesis of not one but all forms of epidemic sickness.

Both these principles were long ago incorporated into the general stock of professional beliefs. No text-book of medicine, not even a text-book of bacteriology, but pays verbal homage to the doctrine of varied natural immunity; hardly any practitioner of medicine passes through a day without remarking that so-and-so's ailments are due to the cold snap or the oppressive heat or the change of weather. But how far have we really advanced from the Galenical position?

Take first the case of temperaments, natural and acquired, in the special instance of phthisis. The phthisical type created in the third book of Epidemics,[1] runs like a thread through the whole fabric of medical literature. From Hippocrates it passed to Galen then to the post-Galenical Greek writers and to the Arabians. After the revival of learning we find it in Lomm (1560), in Morton (1694), and so through the eighteenth century; in the nineteenth century it confronts us once more in the treatise of Andral (1829) and the twentieth century medical student will find Hippocrates' words in the latest edition of his "Osler." Certainly there is "great repetition and but little new matter." If this only meant that the rôle of temperament, whether innate or acquired, in the ætiology of phthisis had been finally determined, to carp at the repetition would be as silly as to jeer at a family resemblance in proofs that angles at the bases of isosceles triangles are equal one to another. But it is not so. The diversity of opinion is immense. Upon certain industries, for instance the printing and boot and shoe trades, the incidence of pulmonary tuberculosis is very heavy. Galen, I suppose, would have argued that (*a*) persons of innately susceptible temperament were attracted to these trades and (*b*) that the habits of life imposed by the trades deteriorated the initially sound temperaments and would have slighted the "seeds of pestilence." In rectifying his omission in the last particular, do we altogether justify ourselves in leaving knowledge of the first two precisely where he left it and in merely repeating the *ipsissima verba* of his master?

Phthisis is a glaring example because with reference to this disease, considered epidemiologically, the trend of opinion has varied so much and so irrationally. But the same neglect of temperamental factors, the same failure to quantify our thoughts respecting them, is observable throughout all general ætiology.

Some excuse for our failure in this department of research is the perplexity of making a choice between the possible differentiæ of physical temperament which could be brought into relation with the varying incidence of disease and the comparatively recent invention of an adequate instrument of research, a technique hard to master but not more complex than those employed in many branches of medical investigation. This excuse will hardly serve when we pass to the other neglected subject, that of medical meteorology.

Sydenham says that he paid much attention to medical meteorology, but without result.[2] Huxham carefully recorded the weather and the rainfall throughout his epidemiological annals. The Registrar-General has for many years provided data which hardly any medical investigator uses. Dr. Farr

[1] Van der Linden's edition, i, p. 728.

[2] "Observ. Med.," I, 2 (4).

twice published researches[1] into the relation between temperature and the death-rate, and his two notes remain (a not infrequent occurrence in connexion with the writings of that great epidemiologist) among the best yet made. Quite recently Dr. Huntington, of Yale,[2] has published some suggestive work and, in mere bulk, the extant literature is not small. But the results achieved are meagre. Every student is acquainted with the seasonal fluctuations of respiratory diseases and with the phenomenon of summer diarrhœa, as was Galen; I do not know whether many physicians are much wiser.

Perhaps we have made the mistake attributed by Galen (with little enough justice) to Erasistratus. Because many have been smitten with fists and lived to tell the tale, we do not attach much importance to the blow which seemed to end the career of the old woman. Because no weather, not even the rigour of an English summer, is a sole sufficing cause of *any* disease, because the pestilential katastasis even in presence of the most pathological crasis is not a sufficient cause of any epidemic, we are disposed to think that medical meteorology is not worth bothering about and that Galen only attended to it because he knew no better.

Another reason is that the task of measuring the relation between, say, meteorological variations and variations of the incidence of respiratory disease upon the population is laborious and unspectacular.

I must not extend this already too long paper by interpolating fragments of an unfinished research but a few explanatory words may be permitted.

Any bill of mortality shows that the death-rate from respiratory diseases is higher in the winter than in the summer. Here these diseases are at their ebb in August and September, the tide rises through the autumn and reaches the flood in late winter or early spring. It may be readily shown that if one plots the average deaths or death-rates as ordinates against the temperatures of the air in the previous weeks as abscissæ, the summits of the ordinates fall upon an almost regular curve. If, however, from such an average relation we attempt individual predictions, we essay to determine from a knowledge of this week's temperature how many will die of respiratory diseases next week, we shall gain little but disappointment. The reason is that we have brought into relation with the deaths only one meteorological variable, one which is not independent of other variables we have not measured. This is to say that we are only at the beginning of our task. To reach our goal, a complete specification of, *and measurement of*, "atmospheric" factors which modify the death-rate from respiratory diseases is needed and will be a serious task.

Here I may take leave of Galen's epidemiology. To our stock of precise epidemiological observations he has contributed hardly anything; in the hands of his successors, his theories became a mere jargon. His reiterated emphasis upon the complex of non-specific factors which are involved in the genesis of a pestilence is, I believe, a just emphasis. The saying that what is the matter with the poor is—poverty, is more than a cheap witticism; so also what is the matter with the sick is not merely infection with this or that bacillus, it is unhealthiness, the resultant of a complex of ætiological factors.

It is more than a coincidence that the physician who practised in Imperial Rome when the vices of the old order of urban civilization were clamant for a remedy they did not find, and the early Victorian reapers of a pathological

[1] "Vital Statistics," 1885, pp. 411 *et seq.*

[2] "World Power and Evolution," Yale, 1919; "The Modern Hospital," xiv, 10.

harvest seeded in the industrial revolution, reached essentially the same point.

We who practise our art in still more dangerous times, who have experienced one dreadful pestilence and have no assurance that other and yet more horrible calamities may not await us, cannot afford to neglect the warnings. We ought not to see in medical history a fantastic revue, clever and picturesque Greeks followed across the stage by hooded mediæval obscurantists who give place to ingenious Italians, the scene ending in a blaze of limelight focused upon the bacteriological laboratories of our own time. Nor are we to expect to find in the folios of Galen some magic spell which will free us from the laborious searching out of technical detail which is the task of to-day. But by attempting, patiently and without neocentric bias, to make the experience of the past our own, we may grow wiser. That is the goal of the medical historian.

One last word. In what I have written, I have not attempted to set forth the personality of Galen; it is not for lack of material. The great Hippocrates is but the shadow of a name; our own Sydenham something more, but not very much more. Galen has painted his own portrait. He has revealed those intellectual and moral characteristics which we revere in the great men of classical Greece and also those traits which angered Cicero and were satirized by Juvenal.

One day, when the labour of scholars has rendered the material fit for the literary artist, Galen's story will be told and it is worth telling. There is matter for laughter and perhaps for tears in the fate of the man whose posthumous fame dominated the world for so many centuries and has now grown so dim.

A Latrine of Roman Imperial Time.[1]

By JAMES BERRY, F.R.C.S.

THE latrine is situated in North Africa, at Dougga, an ancient Roman-Carthaginian town, which in the course of the last thirty years has been excavated by French archæologists. The town is near the middle of North Tunisia, some forty miles south-west of Tunis. Under the name of Thugga (Berber Thukka = pasturages) it attained the dignity of a Roman colony, and in the second and third centuries A.D. it was a town of much importance. It is now merely a small Arab village. I visited the ruins some months ago with Mrs. Berry and Dr. Mabel Ingram,[2] and we made accurate measurements

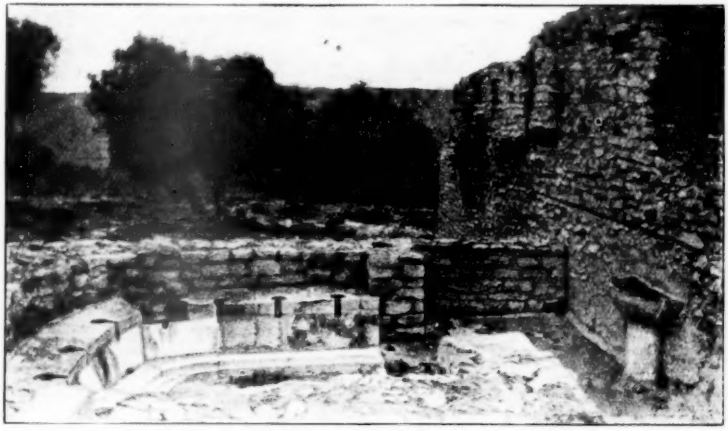

FIG. 1.—View of latrine from north side.

and drawings as well as photographs in the hope that they would be of interest to the members of this Section. My friend M. Merlin, the Director of the Service of Antiquities of Tunisia, tells me that no plan or photograph of it has yet been published.

The latrine lies in the southern outskirts of the town, about midway between the ruins of the theatre and the celebrated Libyo-Punic monument, by the side of a paved street 10 ft. wide which descends steeply in the direction of this monument. Externally it measures 17 ft. 10 in. by 18 ft. 8 in. On three sides it faces respectively a street, an open space and a large water reservoir, against the wall of which it is built. On the fourth side is a passage which runs at right angles to the street and has a mosaic floor. From this passage a doorway leads to the latrine.

[1] At a meeting of the Section, held November 17, 1920.

[2] To whom I am indebted for the accompanying photograph (fig. 1).

Internally it consists of two parts: (1) An irregular oblong vestibule with a mosaic floor. On the side next the reservoir is a (restored) semicircular stone basin fixed to the wall at a height of 3 ft. from the ground. On the other side is a wide entrance to (2) the latrine proper.

The circular stone sockets still existing on either side of this entrance show that originally there must have been here a door, the two halves of which opened outwards towards the vestibule. Around the three other sides of the latrine is a horseshoe-shaped seat 17 in. high and with an average width of 1 ft. 11 in., composed of slabs of hard white limestone $4\frac{1}{2}$ in. thick, resting on walls of rubble masonry and faced with gently inclined slabs of polished white marble.

In the seat are twelve circular openings exactly 6 in. in diameter and 23 in. apart from centre to centre. The centre of each opening is only $6\frac{1}{2}$ in. from the front edge of the seat. A narrow slit $2\frac{1}{4}$ in. wide extends from the

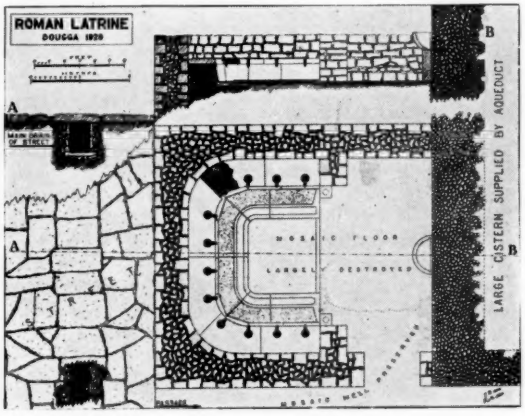

FIG. 2.—Plan and section of latrine.

front of each opening through the whole thickness of the seat and into the facing slabs. The vertical height of this slit is 7 in. On the floor immediately in front of the whole length of the seat is a slightly roughened band of white marble, $8\frac{1}{2}$ in. wide, slightly inclined so that the heels of anyone sitting down would be a little lower than the rest of the foot.[1] In front of this again, on the ground level, is another band of marble $11\frac{3}{8}$ in. wide in which is a rounded groove 6 in. wide and 4 in. deep, evidently to carry off water, since at one end is a small perforation which passes through the slightly raised, 3-in.-wide, marble threshold. The remainder of the floor of the latrine had been covered with mosaic, now mostly destroyed, but in it a guilloche border of the ordinary Roman type can still be discerned in places.

Returning to the seat, it must be mentioned that a large portion of one of the horizontal slabs (including one of the circular holes) has been broken away, exposing the interior of the drain beneath. This shows that the two

[1] This rough surface, however, may have been covered originally by some wooden or other superstructure.

walls on which this stone seat rests are connected by short transverse walls or arches. Although only a portion is actually visible, it is obvious that the open space between the twelve openings must have formed a continuous sloping drain, or rather two drains, converging towards the south-east corner of the latrine at the lowest point of the whole building. Outside, at the level of the street, is visible a rectangular opening about 1 ft. square evidently for purposes of inspection and cleaning. As the main drain of the street is less than 5 ft. from this spot, it is probable that the drain from the latrine was carried directly into this and that the latrine was thus a true *water* closet. But the actual existence of this communication with the main drain I was unable to verify in the time at my disposal.

The main street drain runs under the middle of the street, covered with quadrangular slabs of stone much larger than those used for paving the rest of the street. At intervals of a few yards along the line of the drain are circular openings for inspection, covered with circular slabs of stone.

How the water obtained access to the latrine is not obvious. There was an abundance of water close by, in the great cement-lined reservoir immediately behind the latrine. This was supplied by a branch of the town aqueduct, which is still visible. It enters the top of the south-west corner of the reservoir.

Whether a pipe or other channel in the thickness of the wall conveyed water directly to the latrine drains, or whether the drain was flushed periodically by an attendant pouring water through the seat openings I was unable to determine. The basin in the vestibule was supplied directly by a pipe which came through the wall immediately behind it.

Peculiarities.—There are at least three points in which the structure of this ancient closet differs from similar modern buildings. In the first place the stone seats show no evidence of partitions, between the occupants. It is probable that no such partitions ever existed. M. Ballu, in his description of a somewhat similar, although smaller and rougher Roman latrine in the house of the flamen Corfidius at Timgad, Algeria,[1] comments on this point and says "it is possible that the family or guests met together in this place as in a dining room. This custom existed at the beginning of the last century in certain parts of France!" Secondly, the very small diameter of the openings in the seats, 6 in. as compared with the 9 or 10 in. of the ordinary modern closet. Although there may have been some wooden seat with a somewhat larger opening above the stone seat, this could not well have been of any great thickness, seeing that the stone seat was already 17 in. above the floor. In the Timgad latrine the openings are 7½ in. in diameter. The third peculiarity is the remarkable narrow slit in the stone seat and facing slab. Of the use of this I can offer no explanation. It is obvious that the occupant of the seat would have to micturate through this slit on to the floor in front and not into the receptacle for solid excrementa, since the opening for the latter was so small and so near the front edge of the seat. It is, of course, possible that the slit contained originally some projecting metal arrangement to catch the urine, but this seems unlikely. It is to be noted that the Timgad latrine shows a somewhat similar slit or groove in the same part of the seat, but it is much less deep, and in fact does not extend through the whole thickness of the seat.

Date.—The approximate date (about the third century A.D.) of the latrine

1 Published, with photograph and plan, by M. Ballu, in his "Ruines de Timgad," Paris, 1911.

is fairly clear, although no dated inscription referring to the latrine has actually been found, for all the principal buildings at Dougga are known by inscriptions to have been erected during a very short period at the close of the second and beginning of the third century. The subsequent history of the town, subjected as it was to devastating religious wars, Vandal and other barbarian invasions, and its generally unsettled condition, make it extremely unlikely that a building of such excellence, with its polished marble and beautiful mosaic flooring of the best type, executed in elaborate patterns in five different colours, could have been built at any much later period. In any case the Arab invasion of the seventh century, which completely overwhelmed all Roman civilization in the province, makes it quite impossible that the latrine could have been built later than the Byzantine period which immediately preceded this.[1]

[1] I would draw attention to Dr. Carton's admirable illustrated little monograph on Thugga "Dougga-Thugga," par le Dr. Carton, published by Niérat and Fortin, Tunis, 3 fr.

Section of the History of Medicine.

President—Dr. CHARLES SINGER.

Some Early Hospital Statistics.[1]

By Sir D'ARCY POWER, K.B.E., F.R.C.S.Eng.

WHILST browsing recently in the library of the British Museum, Mr. A. W. Pollard called my attention to a series of volumes catalogued under "London Hospitals," with the press mark 669f. Examination showed them to be a collection of broadsides, &c., issued in the middle of the seventeenth century. Each volume contains a large double folio sheet with an ornamental border, headed "A true Report of the Great Costs and Charges of the five Hospitals in the City of London under the care of the Lord Mayor, Commonalty and Citizens of London in the maintenance of their Great Number of poore in the present yeare . . . as followeth."

The five hospitals were: Christ's Hospital, St. Bartholomew's Hospital, St. Thomas's Hospital, Bridewell and Bethlehem. I have only copied the figures for St. Bartholomew's and St. Thomas's Hospitals. The form is the same for each year though the numbers differ. I therefore give only the first and last in full.

In 1645, at St. Bartholomew's Hospital, "There hath been cured this yeare last passed at the Charge of St. Bartholomew's Hospital of maimed soldiers and other diseased persons to the number of 796.

"Most whereof being souldiers have been relieved with money and other necessaries at their departure.

"Buried this yeare after much charge in their sickness 116 (10 per cent.). Remaining under Cure at this present at the charge of the said Hospital 246."

At St. Thomas's Hospital, under the above three headings and with identical wording, there were in 1645: Discharged, 825; died, 121 (10·3 per cent.), and remaining in hospital, 226.

In 1648 there were cured at St. Bartholomew's Hospital, 831 patients; buried, 170; and remaining in hospital, 300 (14·1 per cent.).

At St. Thomas's Hospital in this year 961 persons were cured, 153 were buried, and 246 remained (11·2 per cent.)

In 1649 there were 985 patients cured at St. Bartholomew's Hospital; 162 buried; 301 remained in hospital (11·1 per cent.).

At St. Thomas's Hospital in the same year 780 were cured, 118 were buried, and 223 were under treatment (10·5 per cent.).

In 1650, at St. Bartholomew's Hospital, there were 1,083 patients cured, 184 buried, and there remained to be cured 292 (11·8 per cent.).

At St. Thomas's Hospital, in 1650, 923 were cured, 118 were buried, and there remained under cure 244 (9·1 per cent.).

[1] At a meeting of the Section, held February 16, 1921.

In 1653, 1,096 were cured at St. Bartholomew's Hospital, 168 were buried, and 322 remained to be cured (10·8 per cent.); whilst at St. Thomas's Hospital 985 were cured, 152 were buried, and there remained 262.

In 1655, 1,154 patients had been cured at St. Bartholomew's Hospital, 211 had been buried, and there remained under cure 361 (12·2 per cent.). At St. Thomas's Hospital 1,052 were cured, 154 were buried, and 249 remained under treatment (10·2 per cent.).

The return for April 4, 1656, the usual date, runs:—

"There hath been Cured this year last past, at the Charge of St. Bartholomew's Hospitall, of maimed souldiers, Seamen and other diseased persons, many whereof being souldiers and Seamen have been relieved with money and other necessaries at their departure, 1242.

"Buried this year after much Charge in their sicknesse, 190 (10·9 per cent.).

"Remaining under Cure at this present at the Charge of the said Hospitall, 308.

"There hath been cured at the Charge of St. Thomas Hospitall this year last past of diseased persons whereof many being Souldiers and Seamen have been relieved with money and other necessaries at their departure, 884.

"Buried this year after much Charge in the time of their sicknesse, 141 (10·8 per cent.).

"Remaining under Cure at this present, upon the Charge of the said Hospitall, 270."

So little is known about the hospitals during the period of the Commonwealth that these returns of the number of patients treated and of the yearly mortality in the two great London Hospitals are worth recording. It may be noticed that the mortality approximated 10 per cent. except in 1648 when for some reason it was 20 per cent. at St. Bartholomew's Hospital whilst the average remained unchanged at St. Thomas's.

Section of the History of Medicine.

President—Dr. CHARLES SINGER.

"Cursed Hebona" as *Guaiacum officinale* (or *Lignum vitae*) in Shakespeare's *Hamlet*, I, v, 62.[1]

By MARSHALL MONTGOMERY, M.A., B.Litt.

THE ghost in this scene tells Hamlet:—

> "Upon my secure hour thy uncle stole,
> With juice of cursed hebona in a vial, . . ."

This "leperous distilment" produced on his "smooth body" "a most instant tetter, . . . Most lazar-like, with vile and loathsome crust," and then seems to have carried him off swiftly. The exact meaning of *hebona* (or *hebenon*, the inferior Folio reading) has long been disputed. For brevity's sake I will ask you to accept the philological fact that it is a lineal descendant of Ovid's *ebenus* (Metam. xi, 610); Virgil in Georgics ii. 117, calls the tree *hebenum*. Golding (in 1567) translates Ovid's *ebenus* with *ebeny*, whereas Gower used *hebenus*. Marlowe's '*Hebon*' in the *Jew of Malta* (iii) and Shakespeare's *hebona* have been identified with these in their origin. They are all variants of the modern *ebony*; and still others will be cited.

This being so, the case for *henbane* seems to me weak on all sides. Like Dr. Brinsley Nicholson in 1880 (*New Shakspere Soc. Trans.*), Professor L. Lewin in 1920 (*Die Gifte in der Weltgeschichte*, p. 109) thinks it could not have produced "the effect described by the ghost." The case for the *yew* is almost equally doubtful. Thomas COOPER, Shakespeare's contemporary, in his *Thesaurus Linguae* (ed. of 1578) takes pains to translate *Taxus* twice, giving it as "A tree like firre, bearing bearies that are poyson. Also the tree called yew." Philology and toxicology are both, I think, against the yew-theory in the case of *hebona*.[2]

And so I come to my own theory, which, so far as I know, was entirely new when I first put it forward in July, 1920 (*Mod. Lang. Review*, xv, No. 3). Since publishing that note I have found a good deal of confirmatory evidence for my view, which is that *Hebona* in our passage is a synonym for *Lignum vitae* or *pockwood*, as it was often called in the sixteenth century, owing to its frequent use in medicine as a remedy against "*French pocks*," leprosy and other skin diseases. I will cite only two or three of the more important witnesses to the fact that the wood *guaiacum* (of which I here circulate a sample kindly supplied to me by Messrs. Jos. Gardner and Sons of Liverpool) was by very many held to be a kind of ebony:—

Perhaps the most read authority is the *Commentaries* of Pier' Andrea MATTHIOLI *on Dioscorides*, originally published in Italian (1544), afterwards

[1] At a meeting of the Section, held March 16, 1921.

[2] With Cooper on *taxus*, cf. Joh. Olorinus Variscus, *Centuria Arborum Mirabilium* (or *Hundert Wunderbäume*), Magdeburg, 1616, p. 46, where he says the "Ibenbaum" (= Eibe, yew) is innocuous in Germany, though it was poisonous "in Arcadia."

in Latin and French. In the French version by du Pinet (Lyon, 1605) chapter cxi is superscribed: "Ebenus: François, Ebene: Arabes, Abanus, and Abenus. Guaiacum, Lignum Indum, Lignum Sanctum: François, Guaiac: Allemans, Frantzosenholz: Espaignolz, Legno Santo, ou Legno de las Antillhas: Italiens, Guaiaco, Legno Sancto, & Guaiacano." In the body of the chapter, after the description of "le meilleur ebene . . . celuy d'Ethiopie," a section follows with marginal heading *Guayac;* in this the writer says: "Or y en a plusieurs, qui estiment le guayac, qu'on apporte des Indes, et dont on use singulièrement contre la verolle, estre une espece d'ebene. Ce que à la verite je n'ose nier . . . ni affermer . . . Bien est vray que le guayac est du tout semblable à l'ébene, excepté que l'ébene est parfaictement noir, et le guayac tire un peu sur le blanc." In D'Alembert and Diderot's great *Encyclopédie* (t. v, 1755) Matthioli is cited as having definitely accepted this identification. In the same way ANDRES DE LAGUNA, the Sixteenth Century Spanish commentator of Dioscorides, is the authority cited in the *Diccionario* of the Real Academia Española (tome iv, Madrid, 1734) for the definition of *guayaco* as "Arbol de Indias, especie de Ebano, de la altúra del Fresno." NICOLA MASSA, *De Morbo Gallico* (Venice, 1563) is still more interesting, for he says *lignum indicum* comes from the Colicut Islands (=*West* Indies?), adds that the Spaniards call it *guaiacum*, and declares cautiously "forte quod est aliqua species ebeni." [For Colicut cf. French *coq d'Inde*, German *Kalekut*.]

Two other witnesses must suffice here. Samuel de CHAMPLAIN, *Narrative of a Voyage to the West Indies in* 1599-1602 (Hakluyt Soc. Transln., 1859), though he does not use the term *guaiac*, almost certainly means *lignum vitæ* by "ebony wood" at p. 37: "I think it not out of place here to say that ebony wood comes from a very high tree, like to the oak: the outside of the bark is whitish and the heart very black." (He adds that the *Brésil* tree is much larger.) But the chief and best known authority on the whole subject is the learned Spaniard MONARDES in his *Historia Medicinal de las cosas, que se traën de las Indias occidentales*, first published in 1565 and translated into English by John Frampton as *Joyfull Newes out of the Newfound World* (London, 1580). This work is cited by Sir Walter Raleigh in the *Discovery of Guiana* (1596) and could easily be known to Shakespeare. Folios 11/12 treat: "Of the Guaiacan and of the holie Wood." The striking thing here is that the *Spanish* form of the word ebony appears in the English text (twice over), as though it were quite familiar, in the following sentences: "And now we come to our Guaiacan, . . . the wood of the Indias. Of this woode many have written and much, one sort saying that it was *Ebano*, others that it was a kind of Boxe. . . ." And, in the next paragraph, ". . . the hart thereof is very great, it is well neere lyke to blacke, all is very hard as much and more then *Ebano*[1] is . . .: of these trees there is greate aboundance in *Sancto Domingo*." In the Latin version by L'Écluse (Antwerp, 1593) the form used is *Ebenum* here, and *aqua guayaci* is the name given to the decocted "juice." Of the *morbus gallicus* Monardes-Frampton says: "Some called it the Leprosie, others Swine-Poxe, other[s] Mentegra, others the Deathly Evill, others Elephansia [*sic*], without certain assurance what disease it was."

This *aqua guayaci* was in general, as by Monardes, thought "a marvelous remedy" to cure the *morbus gallicus*, &c. It remains to show that it was also thought a very dangerous drug to play with. Ulrich von HUTTEN (*De Morbo*

[1] Messrs. Jos. Gardner and Sons write me that *Ebano* is the correct name to this day of the very hard and heavy tree that grows near Lake Maracaibo, Venezuela, and is sold here as "partridge wood."

Gallico, Englished by Thos. Paynel, London, 1533), himself lays down "that we must utterly forbeare wyne and wommen in this cure. . . ." Through neglect of this rule, he adds, "in Almayne, it hapned one felowe to dye." And Strauss relates how the German knight himself died of this disease, in spite of his strenuous use of guaiac water, and further that, while many in Germany believed Hutten had been poisoned, others actually expressed the view that his death was due to the "mörderische guaiak-cur" he had taken. (*See* D. F. Strauss, *Ulrich von Hutten*, 2nd ed., Leipzig, 1871, p. 534, and cf. *Hutteni Opera*, ed. Böcking, II, 352 f.)

A more famous witness still is Benvenuto CELLINI, also a firm believer in this *acqua*, with which he claims to have cured himself twice in 1532, using, however, "all the precautions and abstinence imaginable," and having recourse to it "contrary to the advice of the most eminent physicians of Rome." The second attack was very severe. "My disorder being attended with a fever," he observes, "I proposed to take *lignum vitæ*, but the physicians opposed it, assuring me that if I meddled with it whilst the fever was upon me, *I should die in a week*" (*Autobiography*, T. Roscoe's trans., ch. xi). He, however, took "questa santa acqua de il legnio" (Bacci's ed., 1901, p. 117) and dumbfounded the doctors by recovering. But it is clear that the science of the day was against him, and he was running a notable risk.

Cellini may have owed his good luck to his not being of a melancholic temper. For to such persons as were melancholic this decoction seems to have been most noxious. The general fact is clearly stated in Zedler's *Universal-Lexikon* (Bd. ix, 1735, at col. 1757), where it is reported to have often produced "elephantiasis" and jaundice in *Melancholici*. The principal authority for this assertion is the Belgian medical writer Henri DE HEER, who in No. xxii of his *Observationes medicae rariores* (Leyden, 1685; 1st ed., Liége, 1622, with his *Spadacrène*), under the heading *Errores aliquot Chirurgici mortiferi*, records a striking case. In the year 1608 there came to him "Juvenis ruffus, temperamento cholericus," his skin looking as though it had been combed with a sharp iron grater; "illo leprosiorem per omnem vitam vidi neminem." The patient, being examined, proved, however, to be no leper, but the victim of seven surgeons, on whose advice he had seven times over for forty days drunk *guajaci decoctum*, and thus "tantum non perfectam lepram incurrisse." "Saepe observavi melancholicos, quibus hepar aestuabat, nimio guajaci usu elephanticos factos," he adds, and more to the same effect.

NASHE in his *Lenten Stuffe* (1599) names "guiacum" somewhat contemptuously along with the physicians' vaunted "mithridates compacted of forty several poisons," and their "torturing stibium." And a later British witness, Patrick BROWNE (*The Civil and Natural History of Jamaica*, at p. 226 of edition of 1789) says of *lignum vitae*: "the pulp of the berries purges and vomits very violently." . . . "The resinous parts of the tree . . . are esteemed specifics in old venereal taints . . . and generally administered in decoctions . . . but great care must be taken to moderate or temper the native acrimony of these medicines . . . and to prepare the body for the use of them; the neglect of which has been frequently the cause of very dismal consequents in those warm climates, and may probably have the like effects sometimes in colder regions."

I submit that Shakespeare had knowledge of some such "dismal consequents" of the use of this decoction, and meant to indicate it by the term "cursed juice of hebona." Perhaps he owed his knowledge to Marlowe, perhaps to talk arising out of the trial of the Queen's Jew physician,

Roderigo Lopez, whom Spanish agents in London were said to have bribed to poison the Queen, and who was hanged in 1594 (June 7).

It may be added finally that PARACELSUS is sometimes alleged to have attributed to *ebony* itself the same medicinal powers as those generally given to *lignum vitae*, which he treats of in *De Xylohebeno* (*Op.*, 1658, ii, 215). A certain Michael SCHÜTZ, a disciple of Paracelsus, collected and published at Strassburg in 1565 the observations of Paracelsus himself on this subject, giving the collection the title *Holtzbüchlin*. This begins: "Es ist nicht ohn [i.e. unwahr] | dasz das Holtz | welches ich nenne *Xilohebenum* (sonst *sanctum*, oder *guaiacanum* genandt) ain gut nutzbarlich gewechsz sey," but goes on to detail the fact, now clear and "am tag," "das der gebrauch desselben nit recht verstanden noch gehandelt würt;" in fact its use has fallen very much into the hands of quacks and has been subject to misuse and led to imposture, with the result that many sick persons have been destroyed (*verderbt*) by this cure. Schütz in his *Vorrede* points out that many people spoke of "Theophrasti medicamenta" as "gifft, damit man die leuth tödte," to which he counters: "und ich wüszte vil exempel zu erzelen | so sich in wenig jaren zugetragen haben | da durch das holtz Guaiacum | durch schmieren | reuchen | und wäschen | vil ehrlich leuth getödt | vil aber also jämerlich verderbt worden | das sie ir lebenlang arbeitselig sein müssen | und ihnen der todt vil weger (more desirable) were | dann das leben."

Another curious little work, "drawne out of the Bookes" of PARACELSUS, by Phillipp HERMANN, and "put into English by Iohn HESTER" (printed at London, 1590), with the title: "*An excellent treatise teaching how to cure the French Pockes, &c.,*" deals with cure through "drinkes made of *lignum guaiacum*." It also admits that "there hath been a great abuse committed by divers" in the preparation of the drug. And it is extremely interesting because it asserts very definitely (pt. ii, cap. 1) that "the ancients in past times had knowledge of this wood, and have given it his name . . . for though in all points it doe not agree with that which they call HEBENA, yet I saie that it can not be anie other, but a certain kind of the said HEBENA. The ancients describing the said HEBENA or HEBENUM, doe saie that it dooth not swim, but goeth to the bottom like a stone, and that within it is as black as ynke, and therefore some doo saie that this is not that Hebena . . . ." But the descriptions given by Dioscorides do not in all points agree with our own for the same herbs; "even so it is with HEBENA, for that which groweth in India, is of another colour then that which groweth in Grecia, and yet notwithstanding it is a kind of HEBENA, for it goeth to the bottome, as HEBENUM doth, and is also of the same vertue, curing the same diseases," (op. cit. p. 30).

In the *Epistle Dedicatorie* ("to the Maister, Wardens, and generall Assistants of the fraternitie of Chirurgions in London") Hester speaks of the recent knowledge had of the "French Pocks," a new disease; but says parenthetically "I know some aver it to be *Lepram Arabum*."[1] Is it possible that overdoses of the cure sometimes produced the disease? At least this seems to be clear —that Shakespeare's *hebona* is Hester's *hebena*.[2]

[1] Dr. D. A. Zambaco Pacha states that syphilis and leprosy were confused as a single disease, "dénommée lèpre," till the end of the fifteenth century (*La Lèpre*, &c., Paris, 1914). It is worth noting that the German mediaeval poet, Ulrich von Lichtenstein, in his *Frauendienst* (*circa* 1255), claims to have known and used in his own case a (secret) drug, which had the power of producing a condition of the skin closely simulating leprosy. *See* A. Schültz, *Das höfische Leben*, &c., i, 409.

[2] Are both due to the form *ἰβένη* in Theophrastus, H.P. 4, 4, 6?.

Section of the History of Medicine.

President—Dr. CHARLES SINGER.

The Prehistoric Trephined Skulls of Great Britain, together with a Detailed Description of the Operation probably performed in each Case.[1]

By T. WILSON PARRY, M.A., M.D.Cantab., F.S.A.

ALTHOUGH much concerning the origin of certain customs of primitive peoples has been revealed by the study of early tribal migrations, I am fully convinced that, just as necessity compelled an age of stone-culture in every part of the world quite irrespective of the relative position of the many nations inhabiting it, at times certain ethical reasons made it imperative for some tribes to initiate new customs which, being suddenly born, grew and developed with inspired enthusiasm.

The very fact that primitive trephination was instituted in widely separated parts of the world for totally different reasons tends to prove that a local origin, without any imitation from neighbouring tribes or nations, was sometimes called into being by reason of local ethical necessities.

And yet, in spite of the diversity of causes that conjured up the creation of the custom of trephination, there appears to have been one cause that seems to have linked up every part of the world no matter what nations inhabited it; how far those nations might have been separated the one from the other, or what centuries or millennia may have stood between their respective ages of stone-culture—I refer to that mysterious nervous disorder mentioned in the New Testament as "a possession of the devil," by Shakespeare as "the falling sickness," and by ourselves, in this time, as epilepsy.

Epilepsy, that mystical complaint, which in the mind of primitive man was always associated with either gods or devils, is the one master-key that unlocked, in the past, that crude custom of the making of a hole in the head of a living man in order to release a demoralizing demon supposed to be imprisoned therein. Long before trephination was employed for true surgical reasons this operation was crudely performed by the tribal medicine-man as a cure for demoniacal possession, epilepsy being the chief, but by no means the only, malady that led to its adoption. Madness, severe chronic headache, migraine, Ménière's "complex of symptoms" and unbearable recurrent attacks of vertigo would number among some of the causes that called this primitive operation into existence.

Great Britain, in contrast with its now friendly rival France, is as poor in specimens of neolithic trephined skulls as her fortunate neighbour is rich in them. Indeed examples on this side of the Channel are so rare as to be judged by antiquarians in this country as relics of almost priceless value.

[1] At a meeting of the Section, held April 20, 1921.

Besides the well-stocked Broca Museum in Paris one medical man alone had, in his private collection, no less than 167 of these fascinating records of Neolithic Man's skill, while no less than sixty specimens of trephined skulls and cranial amulets were discovered in the caverns of Beaumes Chaudes alone, in the year 1878.

Great Britain's close proximity to France would have led one to expect that many more examples of this curious custom would have been found in this country. The Channel, however, must have been a very broad sea to the Neolithic navigator and must have acted as a serious obstacle to his reaching our shores more frequently. Had it been a range of hills instead of an expanse of water the result, no doubt, would have been very different.

In eight years' time I have been able to collect no more than eight specimens which have any pretensions whatsoever to prehistoric trephination and of these I have been obliged to discard more than 50 per cent. for various reasons, so it will be seen the number of our British specimens can be counted on the fingers of one hand.

While enumerating and describing these rare examples I wish it to be clearly understood that I take all responsibility for the critical judgment I pronounce in each case.

(I) The Port Talbot Skull.

Had this skull not been mentioned in the lists[1] of British specimens I have already given, it would not have been necessary to include it among our number at the present time. I had not seen the specimen when I previously alluded to it, so was careful not to issue any dogmatic statement concerning it. The skull in question was a genuine neolithic specimen obtained from a peat-bed, 44 ft. below the lowest alluvium, during the construction of a dry dock at Port Talbot in South Wales. Misinformation combined with a bad photograph led me to think there was a scraping of the bone, without perforation, situated over the right supra-orbital ridge. At the time of first seeing the photograph I was struck with the position of the supposed trephination. Prehistoric witch-doctors were usually careful, when selecting a site for their operation, to avoid leaving noticeable disfigurement, in order that the spirit in the future world would not be vexed by an unsightly mutilation. I found this skull, after a journey of over 550 miles, in the little village of Cardigan, in a private collection. You may imagine my surprise and disgust to find there was no scraping whatsoever. This specimen, therefore, disappears for ever from our already scanty list.

(II) The Thames Prehistoric Trephined Skull.

This specimen was dredged from the river Thames about the year 1864. It found its way, along with other skulls from this river, into the well-known Layton collection. A good number of ancient skulls have been dredged from the Thames, the greater number coming from Mortlake; next in order comes Barn Elms, then Hammersmith, where something like a hundred skulls have been acquired, and, lastly, some also from Battersea. When the selection was made from the Layton Collection, for the Brentford Library, the skulls were

1 (*a*) *Lancet*, June 13, 1914 (the Presidential Address read before the North London Medical and Chirurgical Society). (*b*) *Med. Press and Circ.* ("Prehistoric Man and his Early Efforts to combat Disease"), July 15, 1914, Pt. II, pp. 66-67; n.s. xcviii, No. 3,923. (*c*) *Journ. Brit. Archæolog. Assoc.*, March, 1916, n.s., xxii, Pt. I, pp. 42-43.

not thought to be worth exhibiting and along with other "rubbish" were sold at the sale in 1914. Mr. G. F. Lawrence, Excavation Inspector to the London Museum, arrived too late for the sale, but found that a hamper of skulls had been put aside, unsold, for the purpose of being crushed up to make mortar. They were looked upon as the "refuse" from the Layton "rubbish heap." Mr. Lawrence looked them over and discovered amongst them this exquisite priceless relic of prehistoric skill and workmanship. For a few shillings he became possessed of these skulls and this valuable specimen is now safely lodged in the London Museum, the rest of the skulls having been handed over to the Museum of the Royal College of Surgeons. In passing I would like to ask whether it can be wondered that so few examples of this wonderful archaic art exist to-day in Great Britain, when, in this twentieth century, one of these specimens was on the point of being broken up to assist in making mortar. Shakespeare could not have expressed himself more aptly had he been writing about this doomed Thames skull itself when he said :—

> "Imperious Cæsar, dead and turned to clay,
> Might stop a hole to keep the wind away."

The history of the actual discovery of this skull is meagre. It was dredged from a spot just above the place where Hammersmith Bridge now stands. It is not on record whether other skulls, or portions of skulls, were dredged *at the same time*, from this site, or whether any objects of the Neolithic, Bronze or Early-Iron Age were also brought to the surface when this skull was discovered. It is well-known, however, that traces of pile-dwellings of the Early Iron period were found on the Surrey side of the river at this point. These have now been dredged away. At various times objects of stone, bronze and early-iron have been brought up from this site, showing that the occupants of pile dwellings, inhabiting this vicinity, were living in that locality during the Neolithic, Bronze and Early-Iron periods. This skull must therefore be dated not earlier than the Neolithic Period and probably not later than the Early-Iron Age.

The skull, which is of the river-bed type and somewhat heavily mineralized, is not quite complete. It contains, however, most of the frontal and parietal bones, nearly all the right temporal except a small part of its squamous portion and most of the occipital bone, the latter being of a bulging character, consistent with its river-bed type. The left temporal and all the face-bones are missing. All the bones are firmly ankylosed together. The coronal suture can be followed in nearly all its extent. The line of the sagittal suture can be made out, but is partly obliterated, as is also the lambdoidal suture towards its superior part.

The measurements of the skull, as far as they can be taken, are as follows: Length, 189·5 mm.; breadth, 142 mm. (conjectural); height, 116 mm. (conjectural); minimal frontal, 99·5 mm.; maximal frontal, 107 mm.; inter-orbital width, 32·5 mm.

The trephine opening is situated precisely in the middle of the sagittal suture, 52·5 mm. distance from either end. The long axis of the hole lies obliquely across the sagittal suture, and examination of the inner surface of the skull reveals the fact that the opening partly crosses the path of the groove for the longitudinal sinus. This shows that the operator, though skilled in rude surgery, was nevertheless a bad anatomist for choosing such a site for his operation. It was quite a miracle the patient did not lose his life by hæmorrhage, which he would most certainly have done had the longitudinal sinus been wounded. The operation was entirely successful,

and the patient, a man of some 50 years of age, recovered and lived for many years after.

The hole shows shelving sides at the expense of the outer table of the skull. Its measurements are as follows: Greatest length, 33 mm. (outside measurement), 19 mm. (inside measurement); breadth, 30·5 mm. (outside measurement), 11 mm. (inside measurement); depth of hole, about 4·5 mm.; thickness of trephined edge of bone, 1 mm.; thickness of skull, from 5 to 8 mm.

This specimen is a fine example of the flint-scraping method. This is recognized by the gradual sloping down of the sides from the external to the internal table of the skull. The internal table round the perforation is intact, which would not be the case if the hole had been created by a puncturing blow. In a well-marked case, as this specimen examples, it is seldom difficult to be deceived as regards a hole made artificially in this manner. The surface of the trephined part is smooth and shelving over the right half, but on the anterior part of the left half little rough ridges of new bone have been formed during the process of healing.

From a careful examination of both prehistoric and present-day primitive trephined skulls, together with a full knowledge obtained by eye-witnesses of this operation as performed, in our own day, by primitive men still in a state of stone-culture, an accurate account of what happened in this part of prehistoric Europe can be, with confidence, now placed before you.

The patient, lying either on the ground or on a suitably felled tree-trunk, has, a willing victim, completely resigned himself to his fate. Dominated by the strong personality of the medicine-man, buoyed up with hope or pride either that physical inconveniences, from which he has been a sufferer, are now going to be removed, or that glory awaits a successful operation, for ethical reasons, his mind is hypnotized into a state that feels no pain or if at all, is anæsthetically benumbed. The surgeon kneels by the side of his patient or behind him, his head firmly gripped between his knees, a large number of freshly flaked flints lying beside him on the ground. There will be at least two assistants in attendance. The hair is parted so as to expose the chosen site for the incision. The assistants hold it back on either side. The surgeon, with one stroke, cuts through the scalp to the bone. This single stroke may be long enough to allow the flaps to be pulled apart by the assistants, who at the same time nip them with their thumbs and fingers to prevent bleeding. If this first cut is insufficient for the surgeon's purpose, it is quickly converted into a V or Y-shaped incision, so that ample room may be obtained for getting at the bone. The same, or another, flint is now used to scrape away the pericranium from the selected site. Having done this the operation of making a hole in the bone is commenced. For the scraping operation, a series of scratches, made by a sharp-pointed strong flint flake, on the same line, soon make an impression on the outer table of the skull. This, followed up, converts the line into a groove. The groove, when deepened, begins to show two prominent sides which must be now attacked, by the edge of the scraper, to convert the depression into a basin-like ellipse. This basin is now deepened and widened until it is found to be becoming oval or circular. After the dense outer table has been entirely removed over the site in question, the softer middle-layer of the skull, the diploë, is more easily scraped or scooped out till the inner table is slowly but surely revealed. The experience of the surgeon has taught him that immediately under the inner

FIG. 1.—Vertex view.

FIG. 2.—Lateral view.

The Thames Prehistoric Trephined Skull (Early-Iron Age).
[The London Museum.]

table lies a membranous covering to the brain (the *dura mater*), and he must, on no account, injure this or the patient will probably die. He accordingly proceeds with much greater caution. To make sure of the thickness of bone still separating his implement from the brain of the patient he tests, with the sharp point of his implement, much in the same way as we should use a probe nowadays, to see whether the plate is thin enough to be perforated. By this means and by more judicious and discriminating scraping he eventually exposes the *dura mater*, picking out any bits of the inner table or bone detritus that may have fallen on to the membrane. Not having cocoa-nut shell or suitably thin sea-shell, in this part of Europe, to place over the hole to protect the brain, as is used sometimes in the South Pacific Islands, the surgeon would just carefully replace the flaps, lay on them freshly-picked leaves, in place of banana skins, which they employ in tropical regions, place on this again dried grass or thin bark as a dressing and fix it firmly with tough bast or long dry grass.

I have pointed out elsewhere that, of natural objects, used as surgical implements, none perhaps could be chosen more aseptic than freshly struck off flint flakes or newly chipped or flaked obsidian. No doubt this was the chief reason why such a large percentage of patients survived the operation, though we have, unfortunately, ample proof of others having become septically infected and the patient dying. An operation of this kind can be done satisfactorily on the cadaver in thirty minutes.

(III) The Eastry Skull.

In the excellent Public Museum of Liverpool is a skull of extraordinary shape and proportions. It is said to hail from an old graveyard in Eastry, Kent, but the information as to its origin is of the scantiest nature possible. [That a skull may have been disinterred from a graveyard does not preclude its being early historic or even prehistoric, for churches and graveyards are not infrequently superimposed on prehistoric sites.] The skull is not only grotesquely shaped, but is distorted, a distinct twisting to the left being clearly noticeable. The sutures, all but a small portion of the lambdoidal, are completely obliterated, and it is this, the early ankylosis of the coronal and sagittal sutures, in my opinion, that has given rise to the peculiar bulge of the posterior part of the skull. The brain was unable to expand in its usual equable manner, owing to this anterior premature joining up of the frontal and parietals, and so was compelled to enlarge posteriorly, and thus give rise to the abnormal cranial development in this direction. Added to this two large holes are observable in the parietal bones, which are symmetrically placed over their posterior angles. These holes undoubtedly simulate perforations artificially produced by primitive trephining and led Dr. Robert Munro to believe they were the result of human workmanship. He has described this skull in his "Prehistoric Problems" as being an example of the only double primitive trephined specimen in Great Britain. The position of these two holes, their symmetrical emplacement and the edges of the apertures being bevelled not only at the expense of their external, but also, to a lesser degree, of their internal tables, leaves me in no doubt that this is a typical specimen of congenital deficiency of the parietal bones. It is the skull of a microcephalic idiot, and it is not to be wondered at that this monstrosity of a skull suggested to Dr. Munro that the operation of primitive trephining had been performed for the relief of probably untoward symptoms.

The principal measurements of the skull are as follows: Length (glabella

to farthest point), 163·5 mm.; breadth (above and behind ear), 116·5 mm.; height, 141 mm.; minimal frontal measurement, 67·5 mm.; maximal frontal measurement, 91 mm.; interorbital width, 20 mm.

Measurements of holes: The left hole is roughly oval. Greatest length, 40 mm.; side to side measurement, 32 mm. The right hole is nearly circular, and does not extend so far backward as the left. Antero-posterior measurement, 30 mm.; side to side measurement, 32 mm. The margins of both holes are bevelled externally and, to a less extent, internally, and the outer surface of each is marked by numerous diverging striations. The thickness of the skull over the perforated site varies from 3·5 mm. to 5 mm. The average thickness of the skull is about 5 mm.

FIG. 3.—The Eastry Skull. An example of double congenital deficiency of the parietal bones in a microcephalic idiot. This was mistaken by the late Dr. Robert Munro for an example of double primitive trephination. (Illustration from his "Prehistoric Problems.")

[The Liverpool Museum.]

(IV) THE BISLEY (GLOUCESTERSHIRE) SPECIMEN.

Among the curiosities in the craft of prehistoric trephining in Western Europe are found, exceedingly rarely, specimens which exhibit an unfinished operation. These, in all likelihood, were not completed on account of the

condition of the patient, the surgeon being frightened to continue what he had quite ably begun. It may have been that he was unable to arrest the hæmorrhage or that the operation having been postponed till the patient had become too weak to undergo so severe an ordeal, sudden collapse or even actual death may have supervened to bring the proceedings to an abrupt termination. The cases to which I refer exhibit no signs of reparation which, in my opinion, under such circumstances, speaks volumes. These specimens are of the greatest possible interest to us as they show, in a way that nothing else could, the initial steps in certain methods of this primitive proceeding. Such a specimen is to be found in the Geological Section of the Museum of Lisbon. The cranium in question was discovered in the grotto of Casa da Moura at Peniche in Portugal, which contained the remains of no less than 140 individuals of the Neolithic period. The site of the operation was the left parietal bone and the piece to have been removed was 60 mm. long by 20 mm. broad. The specimen I am now bringing before your notice, found in England, is in many respects, in my opinion, comparable with this.

It is a portion of the right side of a frontal bone separated behind along the coronal suture and exposing, in front, part of the frontal sinus. A small part of the orbital plate is present with the foramen for the orbital branch of the fifth nerve intact. Professor Keith regarded the specimen as belonging to an old man of a Bronze Age race. At first sight one might easily imagine that an instrument, built on the model of our present-day trephine, had been employed, but on closer examination the ring excavation in the bone is observed to be oval, rather than circular, in character, which of course at once abolishes this idea. Its measurements are about 31 mm. long by 28 mm. broad. The oval furrow varies slightly in width, due partly to weathering and measures from 3·5 mm. to 4·75 mm. On the under surface of the bone and in one part exactly opposite that portion of the trephine-ring where a small deficiency of bone has occurred (which does not give the appearance of having been made by any implement, but rather a centre of crumbling of the bone) is a large patch of bone deprived of its inner table. The inner table everywhere else is hard, firm and equally mineralized, while the part in question measuring roughly $1\frac{3}{8}$ in. by $2\frac{1}{2}$ in., is rough and irregular, like a similar patch on a Melanesian skull in the Museum of the Royal College of Surgeons. For my part, I believe there was present in life an osteitis, which would be a sufficient reason for the attempt of a primitive surgeon to endeavour to alleviate a chronic and probably well-nigh unendurable headache or other head-symptoms caused by its presence. The attempt, however, was not successful, for the patient passed away before the completion of the operation, or the surgeon gave up and the patient died shortly after, as there is no sign of any osseous reparation, which Nature would otherwise have exhibited.

It was found in a long barrow, near Bisley, in Gloucestershire, in the autumn of 1863, by the late Dr. W. H. Paine, of Stroud, assisted by Dr. Henry Bird. It is difficult to say exactly how the excavation was carried out, but it appears that pains were taken and notes were made. Alas, however, the notes have been lost! Search has been made everywhere for them by Dr. Paine's son, Mr. Alfred E. W. Paine, to whom the specimen now belongs, but they cannot be found. They appear to have been sent to Dr. Thurnam, of Devizes, who eventually left his specimens to Cambridge University. Inquiries there have shown that no notes of Dr. Thurnam are to be found with his bequeathed collection. Now, it is well-known that long barrows in Gloucester-

shire are Neolithic, that is to say a primary interment in one of them would be so, but the difficulty is to really know whether any given interment is primary or secondary. At first I must confess I thought this specimen belonged to the Bronze Age, as Professor Keith suggests, that is to say was a secondary interment. Acting upon this assumption and believing, at the time, that the trephination could not have been done by stone, I made an experiment on a skull with a metal gouge, similar to a Bronze Age gouge I had seen in the British Museum. The result, in my opinion, allowing for the weathering of the bone, was a convincing one. Since then, however, acting on new lines, I have been able to copy this original trephination by the use of a stone implement. As this method has not been described before I will lay before you details of the operation for your consideration and criticism.

FIG. 4.—The Bisley (Gloucestershire) Trephined Skull (Neolithic).

[Mr. A. E. W. Paine's Private Collection.]

The Casa da Moura specimen gave me the idea of how our primitive European medicine-men went to work as regards this method of manipulation. I chose a neolithic beaked implement and used it in the manner of a plough, holding it firmly between the index finger and thumb of the right hand and pushing it forward. Ploughs, as one is aware, are usually *pulled* by horses or oxen, but in this case the plough is *pushed* forward to carve out, at first, a thin and shallow furrow and later a deeper one, that burrows through the diploë down to the inner table of the skull. I show you pictures of three stages of this operation, on a recent skull, with the implements I used; also the specimen itself with the removed rondel. It is my opinion that the extremely large pieces of bone that were abstracted from living skulls, during the Neolithic Period, in France, and showing definite signs of reparation, have been done in this way. Lucas-Championnière believed them to have been done by boring

a succession of holes close together in a circle and then breaking down the intervening bridges of bone by flint saws. In this case the removed rondel of bone leaves behind it a ragged hole composed of the half-circles and half-bridges of bone forming the margin of the foramen. In some cases this was doubtless quite correct and we know for certain this method was adopted by the Incan and Pre-Incan races of Peru and indeed, in certain cases, traces of the holes can be identified. In others, however, the whole appearance of the trephined ring tends to show that the immense rondel removed was done by one deep furrow followed by sawing in a sloping manner up to, or even just through, the inner table of the skull and then by the use of a flint or bone elevator the rondel itself came away with one single leverage. By Lucas-Championnière's method, after the boring had been effectively carried out, the sawing of the bridges between the perforations severed and the rondel removed, the margin of the hole had still to be scraped round in order to destroy the ragged parts of the many perforations that had been employed, before the specimen was brought to look like those found in the dolmens, with a smooth and shelving edge from the external to the internal tables. This latter operation would be an additional clumsy performance, giving extra trouble and more likelihood of sepsis, on account of the extra débris, and would not, in my opinion, appeal to the mind of a skilful Neolithic surgeon.

Dr. Thurnam in his paper on "British Barrows," published in *Archæologia*, vol. xliii, pp. 201-203, refers to this Bisley Barrow. It is No. 19 of the ones he mentions. The result of the exploration is stated to be "successful in part, 1863," and the Primary Interment contained "remains of skeletons." His references are, as has been stated, to Dr. H. Bird and Dr. W. H. Paine. If we may gather from this that there was only a primary interment and no secondary ones, I think we may take it that the case is proved that the specimen is Neolithic in date. This, then, would be the earliest specimen of the kind in Great Britain and it makes it peculiarly interesting in that it is not a case of simple scraping, as is the commonest type of primitive trephining found in the French Neolithic period, but is a daring attempt at a more advanced method of procedure than one would have expected at this time and place, when practice in the art was so rare.

(V) The Northampton Skull.

This is the specimen that has been longest known to archæologists. Indeed it is the only one, I may say, that has been noticed in general text-books on archæological subjects. I am afraid it has acquired a reputation far greater than it deserves. Details of the skull itself and its trephination, accompanied by illustrations, are to be found in "Excavations in Cranbourne Chase" by the late Lieutenant-General Pitt-Rivers. During the excavations of Hunsbury Camp, near Northampton, three skulls were unearthed; two of these were discovered in the Camp itself, and the third one (this specimen) just outside it. Now Hunsbury Camp is Early-Iron Age, and I think it may be taken that this specimen, found just outside the camp, belongs also to this period. The trephined area is placed exactly on the vertex of the skull and consists of three holes, each 1 cm. in diameter, the posterior one on the sagittal suture and the other two on either side of it, forming a rough equilateral triangle. Now these holes could not possibly have been made by any stone implement, as their sides are perpendicular. In my opinion, they were made by a metal (iron or bronze) implement of the nature of a borer and then their sides scraped by a metal scraper, as the uniformity of the holes is not such as to permit one to believe

they were made by a borer alone. I have not the slightest doubt that these holes were made after the death of the individual on his empty skull, and my opinion is they were made for suspending the skull as a trophy by an Early-Iron Age headsman. This is consistent with its being found just outside the Camp where trophies of this kind were usually hung. Mr. Alexander Curle, the courteous Secretary of the Museum of Antiquities of Edinburgh, pointed out to me a specimen they had in the museum, with a similar posthumous triangular trephination, exactly on the vertex of the skull, which was found in the Hillhead Broch at Caithness in Scotland.

FIG. 5.—The Northampton (Early-Iron Age) Trephined Skull. (Illustration from "Excavations in Cranbourne Chase," by Lieutenant-General Pitt-Rivers.)
[The Northampton Museum.]

(VI) THE RIVER WEAR SPECIMEN.

This is the only specimen of this group that I have not as yet seen. I speak, therefore, guardedly; though no great pretensions have been put forward concerning it, and it seems, both from the description of it and the photograph that I have received from Dr. T. Coke Squance of Sunderland, to be just another example of posthumous trephination. It was dredged from the River Wear in Durham. Dr. Squance says: "It is a skull of the negroid type. A point of special interest is the perforation in the posterior portion of the right parietal bone; the temporal muscles have been very large, and from the sutures, and character of the bones, we may infer that the skull is that of a male about 30 years of age. It may be assigned roughly to the later period of the Neolithic Age. When the dawning of religious belief occurred, the skulls of the deceased were not infrequently trepanned to allow the 'ghost' easy egress and

ingress, and the position of this hole permits us to infer on which side the body was laid." The picture of the hole on the photograph sent me by Dr. Squance leads me to believe that the skull is a good deal later than the Neolithic period. The hole appears to have almost perpendicularly cut edges which would be quite impossible to make on a living man's skull with a stone implement of any kind. It appears to me to have been made, post-mortem, by a metal borer followed by a metal scraper. I have examined in the Museum of the Royal College of Surgeons, a large number of skulls from the South Pacific Islands, where the custom mentioned by Dr. Squance of boring a hole, after death, for escape of the spirit was not by any means uncommon. In every instance a small hole is bored, exactly on the sagittal suture, at the centre of the vertex of the skull. Its position, therefore, in this specimen appears to be problematical.

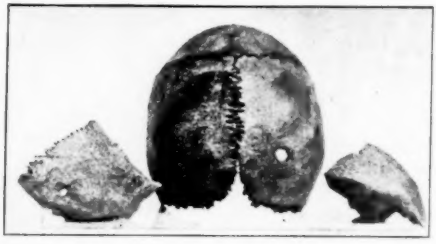

FIG. 6.—The River Wear Skull, dredged near Durham.
(Illustration from Dr. T. Coke Squance, Sunderland.)

(VII) THE MOUNTSTUART (BUTE) SPECIMEN.

Although we have but a mere handful of prehistoric trephined skulls in Great Britain, the few we have are each and all invested with a singular interest. This specimen found in a cist at Mountstuart, in the Isle of Bute, along with a Bronze-Age urn about 8 in. high, a jet necklace, and "a small bit of thin bronze of an indeterminate character," is no exception, but rather a brilliant example of romantic associations and conditions. The skull is that of a young woman who had not yet cut her wisdom teeth. Dr. Robert Munro, who first brought this skull to the notice of the Society of Antiquaries of Scotland, describes it in the following way: "There is a cup-shaped hollow, situated on the left side of the frontal bone, and having in its centre a small perforation. It lies immediately above the temporal fossa, and its anterior margin, which just overlaps the temporal ridge, is exactly 1 in. from the outer angle of the orbit. The exterior edge of this concavity, which measures about 1 in. in diameter, is slightly raised above the normal surface of the surrounding bone, and presents an appearance somewhat like an everted lip. This feature is particularly noteworthy, as it is the result of a pathological process which could only take place in the living body. The actual perforation, which does not exceed $\frac{3}{8}$ in. in its greatest diameter, takes the form of a bluntly-defined triangle bounded with thin edges." Dr. Munro considered this to be an example of pure trephination, where a ring of periosteal bone had asserted itself round the margin of the scraped aperture. Dr. Thomas H. Bryce, on the other hand, in an excellent critical paper, came to the conclusion the hole was entirely

pathological in character. For my own part I believe the truth lies mid-way between these two assertions and that a necrosis of part of this bone had taken place either as the result of an accident or disease, and the scooped-out appearance of the cavity leads me to believe that the necrosed portion was assisted away by the help of the trephine, There is undoubted evidence of a prolonged inflammation of bone which is demonstrated over the site of perforation and its immediate vicinity. The surface is abraded and the diploë excavated in an unmistakable manner. This is not the result of mere post-mortem changes, but of a definite inflammatory process. It is not simply disintegration of the bone by decay, but the result of disease during life. My own opinion is this: The disease was one of long-standing and gave rise to seriously uncomfortable symptoms. There would be pain and discharge and probably a continual headache. There might even have been convulsions. The Bronze-Age Surgeon would be called in. Remember the patient was a woman

FIG. 7.—The Mountstuart (Bute) Prehistoric Specimen (Bronze Age) first described by Dr. Robert Munro. (Illustration by permission from the Society of Antiquaries, Scotland.)

[National Museum of Antiquities, Edinburgh.]

of distinction, she had been buried in a separate and specially prepared sepulchre, with a food-vessel by her side and a costly jet necklace surrounding her neck. It was no pauper's grave. Everything that was possible must be done for her. The surgeon would enlarge the sinus, remove the piece of necrosed bone and scrape that cup-shaped hollow, making a perforation through the bone (at this point as thin as a wafer) into the cranial cavity which Nature, up to the present, had failed to do. This would relieve the most distressing symptoms, no doubt; but the patient must have died shortly after the operation as there is no evidence of reparation, the open pores of the diploë being clearly visible to the naked eye and the general condition indicative of sepsis.

(VIII) THE EDINBURGH SPECIMEN.

For want of a more descriptive title I am obliged to give this skull the name of the "Edinburgh" specimen. Its home, when I first found it along with other bony relics of man and animals, was a little room constituting a small museum now belonging to the Free Church College, at Edinburgh.

This College purchased the museum from the United Free College, in the year 1905-06. "The specimens were then," says Professor Alexander, "in a dilapidated and unlabelled condition." Professor Duns, D.D., who was not an expert in scientific subjects, under whose charge the specimens were (when the museum belonged to the United Free College) stated, in the year 1891: "About thirty years ago it (the trephined skull) came into my possession *as Prehistoric* (among the collection of my predecessor, Professor John Fleming) yet without a history of its finding!"

From a picture of it, which I discovered in Dr. Munro's "Prehistoric Problems," I was much struck by the beautiful bit of craftsmanship exhibited in the trephined opening and I made a special journey to Edinburgh to see it. It was unlike any of the other British specimens and reminded me somewhat of the work of the South Pacific Islanders. To find a specimen in a museum, with no written account of its origin, and to be asked to date it, I think you will agree with me, is no enviable task. Under such circumstances there are only two ways by which we may be guided in endeavouring to discover its age and its origin: (1) The accredited verbal history associated with it, and (2) a careful and minute examination of the specimen itself. As regards the first, we have the trusted words of Professor Duns, which take us back to the year 1861. Now it was not till the year 1865 that Dr. Prunières made his great discovery of the first Neolithic trephined skull, which he had excavated from a dolmen near Aiguières, in France. If, therefore, in the year 1861, before the modern scientist knew they trephined the living human skull in Neolithic days, Professor Duns was given charge of a trephined skull in a certain museum he was asked to take over and he was told that that skull was "prehistoric," I maintain this to be a very strong argument in favour of its being so, as there must have been, one would think, some vivid reminiscence of its finding, for such a definite statement as this to have been made.

As regards the specimen itself. The first impression one gets on seeing the skull, which is in a most excellent state of preservation, is that it hardly looks as if it possessed any very great antiquity. Professor Keith and others are of opinion that it is of a somewhat "negroid" type, which would tend to place it outside the pale of prehistoric British surgery altogether. On the other hand the trephine-opening is such that it makes one feel it has been done by the hands of a primitive workman with primitive tools. Such a trephine-opening could have been done by flint or obsidian. The smooth, shelving edges of the foramen denote, in my opinion, a scraping or rasping of the bone with other than steel instruments, and the shape and size of the hole itself appeals to me as one that has been made rather by the flint push-plough method than by a metal trephine or chisel. The hole is too large a one to have been made by a flint scraper alone, and I cannot think it has been made in this way. Nor do I think it was made by boring holes in a circle and breaking down the intervening partitions of bone as there was no trace whatever of any holes in the trephined circle. From the history of the specimen, the appearance of the skull and the aspect of the edge, size, and shape of the hole, we have a somewhat puzzling and almost conflicting problem to face, and it is difficult to draw definite conclusions as to its real age and origin. If the skull is not British and the hole not of British workmanship, the owner of the skull must have been trephined abroad and have been imported to Great Britain, perchance, as a Roman slave or—and this is perhaps the most likely thing—the specimen itself was brought over by a traveller or collector of curios and presented to the Museum as a peculiarly

interesting specimen. I shall be very glad indeed to have the opinion of experts in order that we may get as near the truth as possible concerning this unique British-owned skull. The cause of the operation appears to have been a superstitious one, as there is not the slightest indication of any diseased bone in the vicinity of the trephine-site, nor are there any signs indicative of a fracture. It may have been due to chronic headache, or even fits. Part of the sagittal suture is completely obliterated, the parietal bones being ankylosed together, but the skull is well formed and appears to have belonged to a man rather above than below the average in intellectual capacity. The operation, needless to say, was entirely successful, the patient living many years after its performance, and probably dying from quite another affliction. By the courtesy of Dr. Alexander, Professor at the Free Church College, Edinburgh, I have been enabled, by exchange, to become possessed of this interesting specimen, and it is now lodged safely in, and is the property of, the Wellcome Historical Museum in Wigmore Street.

FIG. 8.—The "Edinburgh" Trephined Skull.
[Wellcome Historical Museum, Wigmore Street, London.]

Description of the skull: The skull is a well-formed and an excellently-preserved dolichocephalic specimen. Age about 50 years. Length (glabella to farthest point), 191·5 mm.; breadth (above and behind ear), 142 mm.; height, 122·5 mm.; minimal frontal measurement, 100·5 mm.; maximal frontal measurement, 107 mm.; Interorbital width, 31·5 mm.

Face measurements: Upper face length (nasion to alveolar margin), 73·5 mm.; widest facial measurement, 117 mm. [The inferior maxilla is absent, so the total length of face cannot be obtained.]

Description and measurements of hole: Situated at the junction of the anterior two-thirds of the left parietal with its posterior one-third is the commencement of a large, almost urn-shaped foramen. Greatest diameter (outside measurement), 45·5 mm.; (inside measurement), 35 mm.: least

diameter (outside measurement), 34 mm.; inside measurement, 23 mm. Depth of hole about 4 mm. Greatest thickness of skull from 3 to 5 mm. The sides of the opening are smooth and slope gradually downwards, from 3·5 to 8 mm. in breadth. The edges are rounded, no minute foramina being visible anywhere. The surrounding surface of the bone is quite healthy.

The Summing up.

Out of the seven supposed trephined specimens of British origin brought to your notice to-day, one (the Eastry skull) is an example of congenital deficiency in both parietal bones; two (the Northampton and River Wear specimens) illustrate types of posthumous trephination; one (the Mountstuart specimen) shows definite signs of disease, and there are indications that a dead portion may have been hurried away by artificial means; one (the Bisley specimen) exhibits signs of trephining for a diseased condition of bone, but the patient died either during or shortly after the operation, for no reparation of the tissues is present; and two only (the Thames and Edinburgh specimens) show unmistakable signs of trephination during life, both patients not only outliving their operations, but living for long after and dying most probably of some other quite different complaint. Of these two specimens there is a doubt as regards the Edinburgh skull, whether it be of British prehistoric date or whether it was even trephined in this country and, therefore, the only specimen left, the Thames skull, becomes the single example of that weird superstition among our early British prehistoric folk.

Allowing for many specimens having been destroyed by the ignorance or carelessness of the British workman or by others who should have known better, the fact remains that prehistoric trephining, as an early superstition in our island, was not popular on this side of the Channel. Even if we count the Edinburgh specimen as one of British origin, there are only four specimens that have any pretensions at all to a living trephination. Of these, two (the Bisley and Mountstuart) appear to have been trephined on account of disease, and only two (the Thames and the Edinburgh) show no apparent cause why the operation should have been performed, and must, therefore, be relegated to that of superstitious origin—and of these two one, as before stated, may not even be British.

It will be seen, therefore, how supremely rare the performance of this operation was in Great Britain during its prehistoric era, and, therefore, how extremely valuable each specimen is that is ever brought to light. May I finish by exhorting all those present to do everything they possibly can to discover or make known to science any fresh specimen that might happen to come across their path?

Section of the History of Medicine.

President—Dr. CHARLES SINGER.

A Brief Historical Summary of the Treatment of Trachoma, with Special Reference to the Arabian School and the Writings of Ali Ibn-el-Aïssa (Jesu Hali).[1]

By CHARLES GREENE CUMSTON, M.D.

THE origin of trachoma is very ancient. The early Egyptians do not appear to have applied any special pathological attribute to granular conjunctivitis, but they treated certain ophthalmias with the salts of copper—acetate, sulphate, carbonate, malachite—as well as with ferrum oxide.

In Aristophanes' comedy, "The Frogs," mention is made of a form of ophthalmia that was artificially induced by those who desired to escape service in the marine, while in "The Retreat of the Ten Thousand," Xenophon refers to an ocular morbid process of a contagious nature which caused much suffering among the soldiers during their retreat. These are merely literary considerations which have no practical bearing on the subject of this paper.

It is, I believe, very probable that ocular granulations were far more prevalent among the ancient Greeks than is generally suspected and what seems to prove that it was so is the great care that the celebrated practitioners of the epoch gave to the description of trachoma in their writings, as well as the complicated therapeutic measures to which they resorted for the treatment of this affection.

Referring first to what is said of trachoma in the Hippocratic collection, inflammation of the lids is spoken of and a kind of thin paste composed of acetate of copper and juice of unripe grapes is recommended as a local application. Another application was composed of calcinated copper reduced to powder mixed with fat and then moistened with unripe grape juice, dried in the sun, and afterwards again moistened until the consistency of an ointment was reached.

The necessity of everting the lid was recognized and then of rubbing the internal aspect; and the writer continues:—

"When thou rubbest the eye-lids, rub them with clean thick wool wound round a wooden stick."

And again:—

"Avoid touching the edge of the eye (lid) and do not scrape down to the cartilage; thou wilst know when thou hast rubbed enough from the fact that clear blood no longer flows, but (in its place) a sanguinolent or watery fluid (escapes). Then rub with one of the liquid ocular medications, such as flower of copper. After friction and scraping, when the crusts have fallen, when the ulcers are clean and granulate, an incision is

[1] At a meeting of the Section, held May 18, 1921.

made in the direction of the apex of the skull. . . . If the lids are exceeding thick cut underneath the fleshy excrescence as well as thou canst and make in it punctures with a hot iron which should not be red, care being taken not to involve the implantation of the lashes; or produce (obtain) contraction with pulverulent flower of copper (powdery oxide of copper). When the crusts have fallen continue the treatment according to general principles."

Celsus, and his contemporary, Scribonius Largus, advised energetic massage of the granulations with a copper ointment having the consistency of honey, while Dioscorides says that "friction with rough fig leaves or with a little scalpel or with a sharpened bone of the cuttle-fish or with a pencil of acetate of copper" should be carried out. Hirschberg states that the use of fig leaves is to-day a popular remedy in the Orient.

Felix Cassius recommends friction with cuttle-fish bone or with pumice-stone, while Galen extols everting the lids and thorough scraping without medicaments:—

"Some merely scrape superficially with a sharp instrument and control the resulting secretions with a soft sponge. As long as the internal surface of the lids remains rough, use astringents. . . . . Some also employ, in a fashion perfectly in keeping with this end, the rough skins of certain marine animals. One of my masters used a pumice-stone pencil to rub the internal surface of the upturned lids. It is clear that one should employ pumice-stone that has first been reduced to very fine powder and afterwards forming it into a pencil by mixing it with tragacanth or ordinary gum." . . . "If the flux slowly subsides by the use of the pencil we may essay rubbing the lids with astringent medicaments, but at first these are to be employed with caution and later on, when it is found that the patient easily supports them (the applications) recourse should be had to more concentrated (stronger) medicaments."

Aëtius says:—

"Some dare to scrape the granulations with a metallic instrument, others with fig leaves. The enterprise is hazardous. . . ." He then advises massage with astringent ointments.

Paulus Aegineta also everted the lids and scraped the surface either with pumice-stone, cuttle-fish bone, fig leaves or yet with a special instrument in the form of a minute sickle with denticulated edges. Paulus likewise gives the most interesting description of trachoma to be found among the ancient writers, under the heading: *Roughness of the Eye-lids and Granulations.*

He says:—

"Trachoma is an affection of the internal surface of the lid; when it assumes a great intensity, or when it presents notches, it is called the disease of the fig (sukôsis), and when it has become chronic and cicatricial it is called callosities (tulôsis). It is necessary to employ local medication: one a wine, another with 'the two stones' (sublimated ferrum oxide); rub gently with this medicament the internal surface of the lid. The *harmation*[1] with a little swan's ointment or saffron ointment applied to the upturned lid, is likewise excellent in inflammation of the palpebral edge when not complicated with ulcers. But if the callosity is too hard, it will not give way to these remedies; therefore, turn back the lid and rub with pumice-stone, cuttle-fish bone, fig leaves or yet with a special instrument called blepharosustos."

Anagnostakes applied the procedures of the School of Cos, but he was of the opinion that they were intended as a preparatory treatment for the application of the caustic, and bases his opinion on the following passage from Galen:—

[1] This harmation contained four drugs in equal parts, namely, copper, frankincense, resin of Ammon, and gum.

"We begin by rendering the fig-leaflike granulations rougher and only afterwards apply the caustic remedies. We operate in this way in order that the strength of the remedy may act upon the callous excrescences. You know that for this affection I employ the rough skin of the shark, cuttle-fish bone and pumice-stone, and in some cases the spoon of the sound with a pointed end."

Let me here make a short digression. Galen compares granulations of the conjunctiva to fig-seeds. This comparison is most apt. When a ripe fig is split open the small yellow seeds scattered through its dark red pulp recall the aspect of an inflamed palpebral trachomatous conjunctivitis.

Benevenutus Grapheus, who lived in the thirteenth century, perhaps came from the Orient, but he practised ophthalmology in the South of Italy and very probably also at Montpellier. He states that the Saracen women rubbed the internal surface of the conjunctivæ with fig-leaves until bleeding occurred, but that the result of this treatment was not lasting.

Such are the principal data relating to the history of trachoma among the ancients. They possessed a long series of very complicated formulæ into which a large number of products and compound medicaments entered. When these complex remedies were not at hand they employed goats' bile and very refined honey as an application. With the exception of these complex formulæ, we still continue to use the salts of copper as did the ancient physicians, while our modern instruments for the treatment of trachomatous granulations bear the stamp of Galen's kuatsiskos (sharp spoon) and the small knife used by Celsus.

Ophthalmology was practised among the Greeks by general practitioners and also by the priests, but none appear to have been specialists. Contrary to the practice of ophthalmology among the Greeks, there were among the Arab physicians those who, besides a general medical education, acquired by special studies a fundamental basis for various specialities. Their works which have come down to us show that all physicians did some ophthalmology, but that among them there were those who limited their practice exclusively to diseases of the eye.

The oculist was called *al khal*, from *khol* = powder for the eyes or collyrium. Many of these specialists like Ali Ibn-el-Aïssa, Omar, Sadid Eddin-bel-Rakika, Halifa, Salah Ed Dinn, not to mention others, had acquired an experience in ophthalmic practice not to be found in the Greek writings. It is of interest to note that there was a well-known female oculist of whom Oussadia says: "Zina, the wife-physician of the Beni-Aoud, was familiar with operations, dexterous in the treatment of diseases of the eye and wounds, and for these reasons was admired among the Arabs." The precise epoch at which she lived is not clear, but it certainly was before the advent of the Prophet.

Charlatans were with the Arabs as with us now, and Omar relates that:—

"He met at his house (of a friend) many oculists who came from hospitals and other places; there were among them some who knew neither how to write nor read. Among them also was a practitioner who said: 'Here is a remedy that I have from my father who received it in a dream.' And when I propounded questions on the science of ophthalmology, more than one understood not the question and could not answer on account of his lack of scientific study. They knew not the specific remedies and had no experience with the human eye."

"Patients requiring a repellent medicine were given discutient remedies and inversely. They were continually mistaken, but from *amour propre* and personal admiration they considered it superfluous to seek (the advice of) a man of science."

For the Arabs, the classic book on ophthalmology was the *Tadkirat-el-Kahhaline*, written at Bagdad in the eleventh century, by Ali Ibn-el-Aïssa, and it is the oldest book on diseases of the eye that has been integrally preserved in its original language. Now, since the ophthalmology of the Arabs originates from that of the Greeks, and as Ali Ibn-el-Aïssa utilized many important sources which to-day are irretrievably lost—because the author of this book expressly states that he has himself studied the writings of the Ancients—that is to say, the Greeks—it may rightly be supposed that in its pages we possess a good summary of what was known of ophthalmology to the Greeks and Arabs down to mediaeval times. The book is the systematic work of an experienced oculist, absolutely homogeneous and completely preserved. On account of the loss of the Greek treatises on ophthalmology, the passages summarized in Oreibasios, Aëtius and Paulus Aegineta relating to diseases of the eye present very important lacunæ.

But although this work is based upon Greek pathology and therapeutics like all other medical treatises of the Arabs, it contains much that is original as well as acquired, from the teachings of the masters in the time of Ibn-el-Aïssa, which the author personally tried in the exercise of his profession. Therefore we may expect from his teachings much which should be in advance of the knowledge of the Greeks.

The book is written with order and in a perfectly clear style that advantageously contrasts with the rather slovenly arrangement of subjects found in Aëtius and Paulus Aegineta, and I would add that in this respect the mediaeval medical works of the Arabs are unquestionably superior to their predecessors. Ibn-el-Aïssa has a chapter describing in great detail the more frequent and important diseases, such as conjunctivitis, trachoma and cataract, passing rapidly over less important matter. Chapter follows chapter in perfect order, quite in conformity with the anatomical knowledge of the epoch, and in each the author first gives the definition of the morbid process considered, next the objective symptoms, then the ætiology, and lastly the treatment, comprising general therapeutic measures and diet, followed by the local treatment of the lesion. From the viewpoint of literary style, Ibn-el-Aïssa may even to-day be looked upon as a model.

Few have been privileged to see the Arabian MS. of Ibn-el-Aïssa's work, but for some four hundred years there has been in existence a Latin version, entitled *Tractatus de Oculis Jesu Hali*, published at Venice in 1497, 1499 and 1500 (Choulant). Both Neuburger and Hirschberg are high in their praise of the work. Freind was, I believe, the first European writer to mention Ibn-el-Aïssa, but says that he found nothing worthy of note in the book. Ackermann (1792) and Sprengel (1800) do not even mention him. Haeser (1875) gives only the title of the book, while Hirsch (1877) states that it is pure compilation, and this is likewise the opinion of Schrutz. Such slighting remarks are merely due to the fact that these men have only seen the Latin version, which is unintelligible. However, in 1845, Hille published a new Latin version, but only of the first book, while in 1903 Pansier published a translation, using for this purpose the Latin MS. of the Bibliothèque Nationale of Paris. In the same year Arif Arslan published a French version of the first book, and in 1916 Dr. Mohammed Haddou, of Oran, Algeria, translated the fourth chapter of the second book into French, and to him I am indebted for what is to follow. My thanks are also due to the Dean of the Faculty of Medicine of Algiers for his kindness in procuring a copy of Dr. Haddou's very scarce tract.

Ali Ibn-el-Aïssa, surnamed El-Kehal, meaning the oculist, was a Christian,

and lived at about the first half of the eleventh century at Bagdad. His treatise, *Tadkirat-el-Kahhaline*, had such astounding success that physicians studied it only, leaving aside all other works on ophthalmology. The great celebrity acquired by this book can be explained from the fact that in mediaeval times one Hebrew and two Latin translations were made. This celebrity is also made manifest by the large number of MS. copies of the Arabian text which have been preserved and are to be found in the libraries of Florence, Paris, Cairo, Beyrouth, the Vatican, Dresden and Gotha, as well as in others.

Dr. Haddou states that in perusing the book one becomes impressed that the author was a careful physician, especially prudent in operating and also very humane. The fourth chapter of the second book of the Tadkirat deals with trachoma, and I will give an English version from the French of Dr. Haddou. I would add that "Tadkirat-el-Kahhaline" means "A Memento for Oculists."

BOOK II. CHAPTER IV.

The varieties of trachoma (djarb el aïnnine)[1] are four in number. The first is a kind of redness appearing on the internal surface of the lid. The symptoms are as follow: If the lid be turned upward, one will perceive dots similar to those of measles (on the skin). This kind (of trachoma) causes less pain and is less serious than the three others. However, it is also accompanied by a flux of tears which, in most cases, is the consequence of an acute inflammation of the eye. In reality, saline secretions represent the cause of all types of trachoma; the latter are also the result of a prolonged exposure to the sun, dust, or smoke; they are likewise due to a bad treatment of inflammation of the eyes.

To treat trachoma the body must he purified and blood let from the cephalic when this seems possible.

If afterwards it is necessary to take a purge, resort to dried violets with sugar or mirobáanus citrina with sugar, according to the strength of the patient and his age. Afterwards, turn up the lid and rub it with the strong red collyrium.

This collyrium is yet useful in trachoma, pterygion and hypopion, and inflammation of the border of the lid. The receipt is the following:—

Take of:	Washed blood-iron stone (ferric oxide)	6 drachms
	Gum acacia	5 drachms
	Burned copper	2 drachms
	Burned colcothar (red oxide of iron)	2 drachms
	Opium of Egypt	½ drachm
	Aloes of Socotora	½ drachm
	Green wood	2 drachms
	Saffron	2½ scruples
	Myrrha	2½ scruples

The number of ingredients is nine. They are mixed, crushed, passed through a sieve and kneaded with old cooked wine, or if this is not handy, with cooked fennel water; a collyrium is thus obtained and applied.

If this application is successful, so much the better. If not, resort should be had to the green collyrium, the lids being anointed with it. However, this kind of trachoma should never be rubbed with sugar because the final outcome would be nefarious. If the eye presents the sequelae of ophthalmia, turn up the lid and rub it with the mild red collyrium.

Receipt for the mild red collyrium, which is useful at the final phase of ophthalmia, and for mild trachoma, for inflammation of the lids and ophthalmia due to dampness.

[1] Djarb el aïnnine signifies *scabies of the eyes*. In the writings of Benevenutus Grapheus (thirteenth century), it is stated: ". . . et arabi et saraceni vocant infirmitatem istam nimasum id est scabies in oculis . . ."

Take of:	Washed blood-iron stone	10 drachms
	Burned (calcinated) copper	4 drachms
	Coral	4 drachms
	Unpierced pearls	4 drachms
	Leaves of cinnamon of India	4 drachms
	Gum acacia	2 drachms
	Gum tragacanth	2 drachms
	Myrrh	2 drachms
	Resin of the fruit of Calamus Draco [1]	1 drachm
	Saffron	1 drachm

The number of ingredients is ten. They are mixed, crushed, passed through a sieve, treated with old wine, and a collyrium is made in long strips (bands) in order to distinguish the mild red collyrium from the strong red collyrium.

This mild red collyrium is applied until the inflammation and remains of the ophthalmia have subsided. One then returns to (the use of) the remedies already referred to.

And after that, when thou upturnest the lid, it is to be done with prudence, not allowing the lid to fall back into place itself, but begin by careful rubbing and then replace it (the lid) in its proper position. When the eye has become rested from the action of the remedy, place a little fine powder upon it by means of the sound.

Receipt for the fine powder, useful in trachoma and membranes on the cornea, and for inflammation of the eye.

Take of:	Calcinated zinc (tussia) of Kirman in Persia, which has been softened with milk during the space of one night	10 drachms
	Calcinated blood-iron stone, softened in milk	10 drachms

Crush and apply.

Also advise the patient to regulate his diet.

It has been affirmed that if one turns up the lid, and if one besprinkles with the powder of pulverized oak galls, and if after this the lid is allowed to remain upturned (everted) for three hours time, or yet if, during the time it is everted, a fillet (band) is applied, the trachoma is radically cured and afterwards the lid will no longer make matter, so efficacious is the procedure.

Others pretend that if one operates with cloves, a salutary result is obtained.

II.

The second kind of trachoma offers more gravity than the first. It is painful and serious. Both these kinds (of trachoma) render the eye moist and lachrymose.

To treat the second kind it is necessary to begin by purging the body. Afterwards, turn up the lid and rub it with active preparations and introduce the blood-iron stone in the eye by means of the sound. When the heat has subsided, pass to the use of the mild red collyrium and the powder of pearls. Then to the strong red collyrium.

If the trachoma is complicated by ophthalmia treat the ophthalmia in the first place with the method best suited for it, although not neglecting the trachoma itself lest it should increase. But as soon as the ophthalmia is in repose, return to the treatment properly belonging to trachoma. If the trachoma is accompanied by ulcers and mordants [2] apply calming drugs that I shall yet mention in the chapter on ulcers. The best is to first treat the ophthalmia and ulcers, and after their cure return to the trachoma.

Should the roughness of the lid be injurious to the eye, the lid must be everted, held fixed (in this position) and rubbed with the sound until the mordant (inflammation ?) has been calmed.

I knew an experienced physician who, in the case of exacerbated trachoma, everted the lid and rubbed it with the stone of blood iron. By my life! the stone of blood iron is active for roughness of the lids. But beware of fecula [3] and antimony, because both produce trachoma of the lids, the white powder quite as well as the white collyrium.

[1] A palmiferous tree. The active principles of the resin are draconin and benzoic acid. It is astringent and hemostatic.

[2] Meaning probably acrid discharges or perhaps inflammation.

[3] Perhaps the meaning here is tartar = fecula, diminutive of faex = dregs.

The best treatment of trachoma consists in everting the lid, to rub it with medicaments, and then await the subsidence of the inflammation resulting from the action of the medicament; then for the second time evert the lid and rub it. And afterwards, when the inflammation due to the application of the medicament has again subsided, place in the eye three sounds full of pulverized powder in order to fortify the body of the eye.

And if thou turnest the lid upward, and if thou hast rubbed it with the spoon of the sound, and if thou hast lastly applied the strong medicament, and afterwards the green collyrium, this is yet better and more useful.

Description of the green collyrium useful for skin on the cornea,[1] trachoma, and white spots.

Take of:	Light green wood shavings	2 drachms
	Silver coloured calamine[2]	2 drachms
	Resin of Ammon	2 drachms
	Gum acacia	2 drachms
	White of lead	2 drachms

Crush, pass through a sieve, moisten with rue (ruta) water and prepare a collyrium. The number of ingredients is five.

III.

The third kind (of trachoma) is the most severe and most serious. The roughness of the lid is still greater. Here is the sign: Thou seest on the internal surface of the lid an aspect like that of a fig that has burst open; it is because of this that it is also called fig-like trachoma.

Treatment.—The body must first be purged by medicine and blood let from the cephalic. Next the head is purified by bleeding at the angle of the eyes or on the forehead. After this, still farther resort, for purifying the head, to the following measure, excellent for trachoma, eczema, ectropion, sinuses of the eye and nasal polypi.

Take of:	Aloes of Socotora	½ drachm
	Castoreum	½ drachm
	Milk of myrobalanus	½ drachm
	Persian maïran	1 drachm
	Juice of lysium	1 drachm
	Saffron	1 drachm
	White sugar	1 drachm
	Lentils	1 drachm
	Myrrh	1 drachm
	Sarcocolla	1 drachm
	Saponaria	5 drachms

The total number of ingredients is eleven. They are crushed, passed through a sieve, moistened with Maïran water and prepared into pills like (the size of) pepperseeds. But only exhibit them after having bled and after having purified the body by a purge and proper diet. It is only then that it is proper to resort to treatment. Even in other kinds of trachoma it is well to use this manner of preparing the patient. If thou doest not so, thou wilst bring acute matter to the eye. The untoward effect then produced by treatment is greater than its useful effect. Then the lid is everted and rubbed with the royal ointment and green collyrium. If their action becomes clearly manifest it is well, if not, one must rub with sugar or meerschaum or with the scalpel, and this very carefully, until the lid, as far as its thickness is concerned, has recovered its normal state; after this, instil cumin water and salt into the eye and dress the eye with the yolk of an egg and oil of rose that it may be better protected against the attraction of matter (from without). The second or the third day following the friction, introduce a soundful of washed blood-iron stone in order to prevent irritation of the eye. But if in spite of this the eye becomes irritated do not apply anything other than blood-iron stone.

1 Membranous conjunctivitis.

2 I hardly think that the silver coloured calamine referred to can be the calcinated or calamina praeparata which is used as a dusting powder, because this is distinctly pinkish in colour. It is more probable that it was siliccous calamine, a native hydrous zinc salicate, $Zn_2 SiO_4$.

If nevertheless it becomes necessary to employ a powder, besprinkle the eye with powder reduced to dust and yellow powder. Here is the receipt for the latter:—

Sarcocolla	2 drachms
Collyrium of swallow-wort	1 drachm

Rub well together and apply.

If the inflammation has given way, the lid should be everted and rubbed with the mild red collyrium, the green collyrium and royal ointment, until the lid has been cleansed. The diet must be maintained.

Receipt for the royal ointment useful in trachoma, pannus, pterygion, amaurosis and lachrymation.

Take of:	Black pepper	5 drachms
	Long pepper	5 drachms
	China ginger	5 drachms
	Yellow and black myrobalanus with the pips removed ...	5 drachms
	Aloes of Socotora	1½ drachms
	Meerschaum	6 drachms
	Cinnabar	5 drachms
	Cinnamon bark	4 drachms
	Black currants	4 drachms
	Cloves	4 drachms
	Rock salt	1 drachm

The total number of ingredients is eleven. They are crushed, passed through a sieve, well triturated and applied.

IV.

The fourth kind of trachoma is still more serious than the first three, is harder (to cure) and more dangerous and of longer duration: it gives rise to pain and great induration. On account of its thickness it cannot be made to disappear rapidly when once it has become rooted. Occasionally it gives rise to an exuberant growth of lashes. Here is the sign: If thou turnest up the lid, thou wilt perceive that it is dark, cloudy, and covered by cicatrices.

Treatment.—In the first place thou shouldst empty the body and purify the head with gargles with the sacred bitter remedy, or else the patient may take aloe pills for some days with intervals between. Besides, thou shouldst apply medicaments for purifying the head, such as have been above referred to, and order a light diet. Thereupon, evert the lid and rub it with the instrument called the rose[1] or with the scalpel, and this thoroughly.

If at the end of the friction it still appears necessary to rub with white sugar, do so and finish by the treatment above mentioned for the third kind (of trachoma). In all kinds of trachoma thou shouldst always prescribe *the bath* which promotes resolution of the moisture after purification of the body.

Briefly, if the trachoma has become chronic and inveterate nothing is of avail excepting friction with sugar and iron.

If it be still slight and at its onset, it will be cured by caustic applications. After one application of these mordant medicaments, the trachoma is treated by the cinder-like powder, in order to fortify the skins (membranes) of the eye itself.

It would be merely a repetition of what has been said were I to give extracts from the writings of other Arabian oculists. However, perhaps I may be allowed to quote a passage from Omar ben Ali el Mossili, a contemporary of Ibn-el-Aïssa.

Omar finishes his explanation of trachoma with these words: "Do not lose patience with the treatment, because this affection only ends after a long lapse of time. . . . Do not give up treatment, because it is by persistence in it that a cure is to be found."

[1] A metallic, heart-shaped leaf, cutting on both its edges.

For the fourth type of this morbid process, Omar advises the use of an ointment of acetate of lead, and of the operative treatment of the third type of the disease he says : " To treat the third kind, evert the lid, keep it turned up, and scrape it with the scalpel until the lid is cleansed and so that no rugosities remain, then besprinkle with saffron powder and apply a bandage for one day.

I would also add that Halifa ben Ali Mahasin, who practised at Alepa, wrote his *Kitab al kafi fil kuhl* in which he depicts ophthalmologic instruments, among them being the rose (ouardi) and semi-rose-shaped scarifiers.

Such are the data derived from a perusal of the Arabian writings dealing with the subject of trachoma. It has often been said that the therapy of the Arabs was purely empirical and as such, does not merit our attention as medical historians, but in truth is it not to empiricism that the science of therapeutics must appeal as a last resort ?

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